JANUARY 1950

# Plant Engineering

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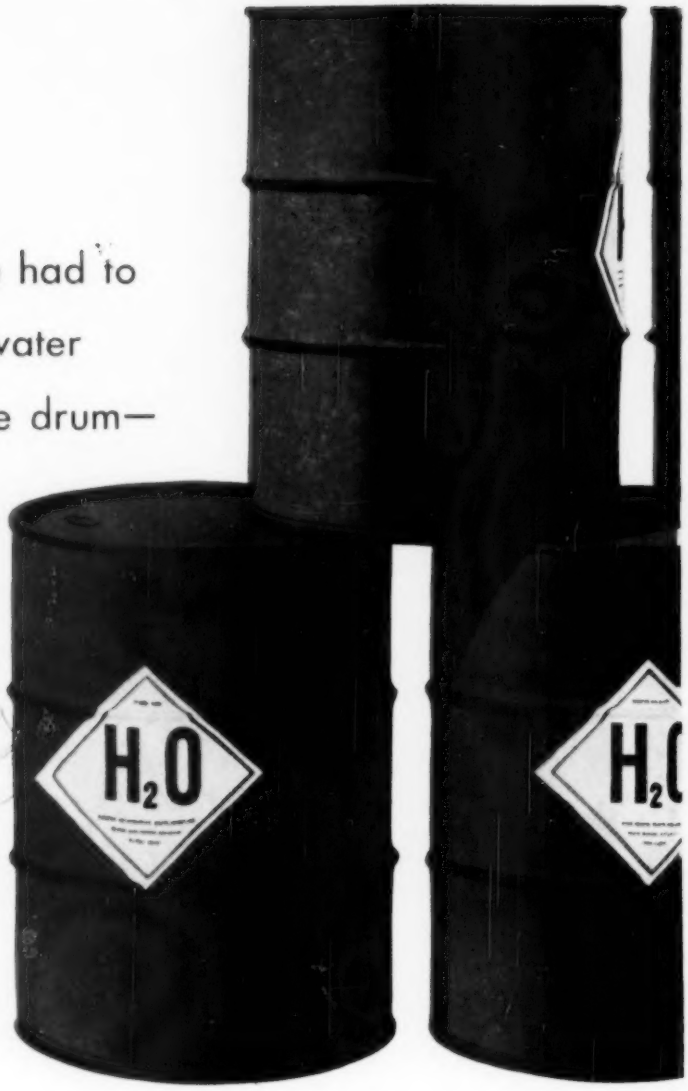
Volume 4, No. 1

The magazine that helps plant engineers with their everyday problems

# If you had to buy water by the drum—




IF WATER were delivered in drums, it would be more easily recognized as what it is today — an important and not-too-plentiful raw material.

Like other materials used in the manufacture of your product and that product may be anything from steam to steel — water must be adapted to the purpose for which it is used, and to the processes employed. It must be used economically and efficiently, valuable constituents remaining in the water after use must be salvaged, and waste must be disposed of at minimum cost and without detriment to the rights of others.

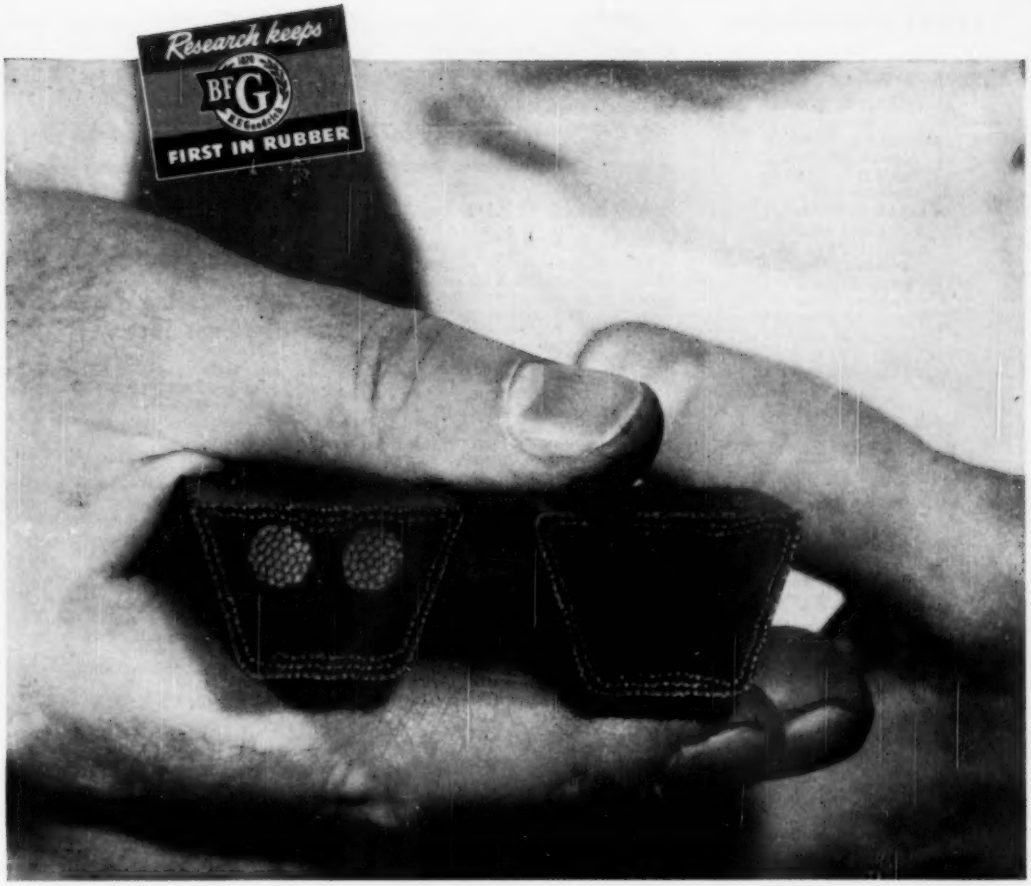
Water is a plant-wide problem, and Hall Laboratories offers plant-wide service, covering any and all water problems from selection of sources to ultimate disposal of waste.

May we send you a copy of our bulletin "Water Problems neither begin nor end at the boiler"?

Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

## HALL *plant-wide* WATER SERVICE

INDUSTRIAL WATER TREATMENT...BOILER WATER CONDITIONING
INDUSTRIAL WASTE RECOVERY AND DISPOSAL




# Can you guess which V belt will last 20 to 50% longer?

THE cross-section on the right is from an ordinary type of V belt; that on the left is from a B.F.Goodrich *grommet* V belt. Both belts are the same size — "E" sections. Both cost the same. Yet the BFG grommet belt may outlast the other from 20 to 50%! Here's why —

*No cord ends* — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends (as in an ordinary V-belt cord section), no stiff, weakened section of "spliced" cord. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

*Concentrated cord strength* — All of the cord material in a B.F.Goodrich grommet V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. This eliminates "dishing" of cords in the center of the belt, insures full use of all cord strength, maximum power delivery, even load distribution. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

*Better grip, less slip* — Because a grommet is endless, free of stiff overlap, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

***Only B.F.Goodrich has the grommet!*** — Twin grommet construction is an exclusive, patented B.F.Goodrich feature — no other V belt is a grommet V belt. (U. S. Patent No. 2,233,294) To get genuine grommet V belts (at present made in D and E sections only) see your local B.F.Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

*Grommet V Belts* BY

**B.F.Goodrich**

**PLANT ENGINEERING**

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Published Monthly by
TECHNICAL PUBLISHING CO.
55 W. JACKSON BLVD.
CHICAGO 4, ILLINOIS

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Subscription Information — Published Monthly. Prices: United States and Possessions one year $10.00. Canada one year $11.00. Other countries one year $12.00. Single copies $1.00.

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Acceptance under Section 34.64 P. L. & R. authorized by United States Post Office.

# 'Round About with the Editors

## What Kinds of Bars Are A, B, C, D?

As a regular reader of your magazine I was very much interested in the article and charts showing the estimated bar shaft weights and volumes on page 40 of your November issue.

After scrutinizing the text and the charts I find that no densities or materials are listed for lines, A, B, C. etc. The ignorance of this point makes the charts useless. I do quite a bit of figuring along this line and would greatly appreciate having the information. *Charles Meylan, Engineering Dept., Wilbur-Suchard Chocolate Co., Inc.*

**One editor gets a hard rap on the knuckles and Mr. Meylan and other readers get a deep apology for the error. If you look on page 52, you will find a re-run cut and the correct caption.**

## Printer's Gremlins Again

Recently we informed the readers that C. C. Hursh had been made Superintendent of Maintenance at Armco Steel, East Works Plant, Middletown, Ohio. That's wrong. **R. S. Hayes** is the man who really was named superintendent; his assistants are **R. W. Martin** and **J. J. Timberlake.** Mr. Hursh is no longer connected with Armco. Our apologies to all concerned. Must be the hot weather.

## Thank You, Mr. Barkley

We shall always look upon our relationship with your firm as one of the finest and I can assure you that it is very heartening to us to note the fine progress being made by Plant Engineering. As you know, we have believed in the paper right from the start, because we think you are on solid ground, and that you really offer something to the man in the plant. *E. R. Barkley, Vice President/Sales, Beaver Pipe Tools, Inc., Warren, Ohio.*

## How Much Puffed Wheat Can You Blow Through?

Recently we eavesdropped, visually, on a letter sent to one of our advertisers, care of PLANT ENGINEERING. Now we know the reason why the old saying "Never trade your troubles for another's."

We have had a lot of troubles, or maybe they are just "bothers" but we never were confronted with the job which R. E. Stroh, Plant Engineer, is facing. Mr. Stroh has to force 1300 cfm dehumidified air through a circular tank, 28 ft in diameter.

That's not so hard, perhaps, but the tank is filled with puffed wheat which weighs 3 lb per cu ft. What is the resistance of 1 grain of puffed wheat? Two grains? A tank full? Perhaps Mr. Stroh has given up too but one PE advertiser has the headache now.

## Plant and Works Engineers Organize Lecture Program

Designed to promote the application of more progressive techniques in engineering practice over a wide field, the newly organized Refresher Course for Works and Plant Engineers was inaugurated recently in the vicinity of Bristol, England.

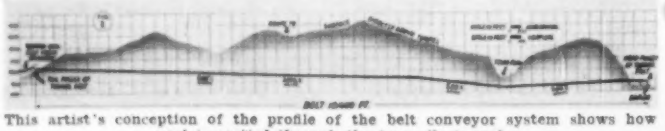
The course comprises a series of 23 lectures by experts in their respective fields, each of the weekly lectures to be followed by a full-scale discussion. Thus far, 225 entries have been enrolled in the course.

## World's Longest Rubber Railroad

The conveyor belt recently installed at the Weirton Mine of Weirton Steel Co., for transporting coal from the washery through a tunnel to the Monongahela River, establishes a new world's record for length.

Measuring 10,900 ft from center of the head to center of tail pulley, this 30-in. wide belt easily beats the former record of 4,985 ft held by a belt installed at Grand Coulee Dam project ten years ago. Installed by Goodyear Rubber's Mechanical Goods Div., the belt is described as capable of delivering 250 t of coal per hour while conveying at a speed of 300 fpm. It is driven by a 200 hp motor.

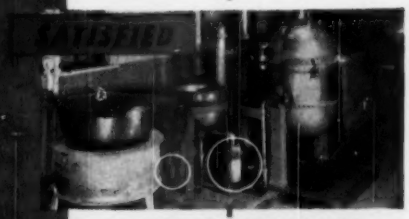
A deciding factor in making the conveyor as a single belt was the elimination of hazards and added operating costs of transfer points. Because of its unique layout, it was essential that any stretch or shrink in the belt be reduced to the absolute minimum. It was impossible to provide space for any take-up arrangement that would accommodate more than about 40 ft of the belt.



This artist's conception of the profile of the belt conveyor system shows how coal is carried through the two-mile tunnel

**"This Steam Trap is unconditionally guaranteed to satisfy you!"**

**YOU CAN'T LOSE**




**SAVED 3758 GALLONS OF FUEL OIL** in one year after replacing old traps with Armstrongs on kettles, low pressure heating system and cream beaters.—*Mary Lincoln Candies, Buffalo, New York.*

**30% LESS MAINTENANCE** with Armstrong traps on heating and steam distribution system.—*John Deere Harvester Works, East Moline, Ill.*

**COOKING KETTLE OUTPUT SPEEDED UP 30%** by Armstrong trapping on each steam jacketed kettle.—*Bulman's Ltd., Vernon, B. C.*

EVERY Armstrong steam trap is guaranteed to be free from defective workmanship or material, to function perfectly, to fulfill all claims in every respect and to give complete satisfaction.

ONLY A GOOD STEAM TRAP COULD *POSSIBLY* BE PACKED BY SUCH A GUARANTEE! To save fuel, to reduce maintenance, to get more work out of existing equipment, to get complete steam trap satisfaction, ask your nearby Armstrong representative to discuss with you the traps you need now.

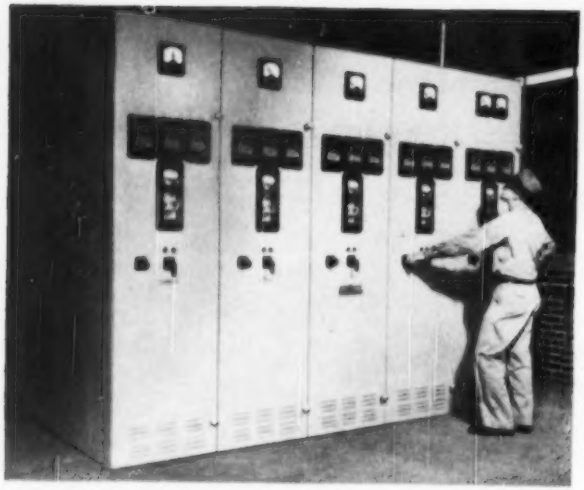
**ARMSTRONG MACHINE WORKS**
**912 Maple St., Three Rivers, Mich.**

SEND FOR YOUR COPY OF THE 36-PAGE ARMSTRONG STEAM TRAP BOOK explaining the design and workmanship that make the Armstrong guarantee possible. Complete data on the selection and installation of traps for all classes of equipment. Free on request.

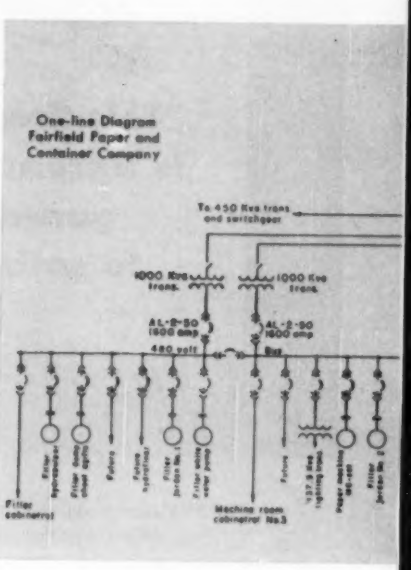
# ARMSTRONG STEAM TRAPS

# FAIRFIELD
PAPER AND CONTAINER CO. chooses a

# METAL-CLAD
for



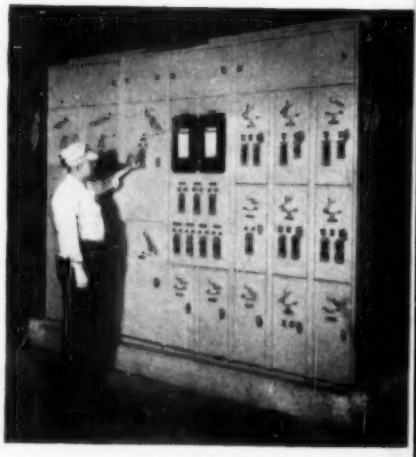
General Electric 5-kv Type MI-6 metal-clad switchgear consisting of one incoming-line breaker and four feeder breakers to handle 4160 volts at Fairfield Paper and Container Co. Magne-blast air circuit breakers are rated 1200 amperes, 100,000 kva interrupting rating. Note neat appearance of metal-clad unit. It's space saving too, and the metal-clad construction offers operating safety to personnel. Units like this are easily installed and can be added to with a minimum of bother and expense. Instruments and relays are co-ordinated for positive protection of circuits.



G-E Cabinetrol units provide centralized control for the liner stock system. Unit controls motors, valves, agitators, etc. Ammeters record load carried by hydrapulper and hydrofiner. Four other Cabinetrol units are used throughout the mill.

The Fairfield installation is a complete General Electric project one source of responsibility plus the very best in co-ordinated planning, engineering, manufacturing, and servicing facilities to give maximum savings and efficiency to the customer.

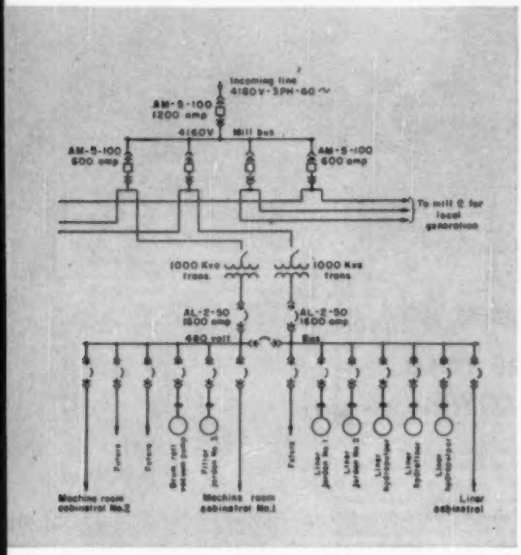
Two G-E low-voltage metal-enclosed switchgear equipments take the 480-volt power from the 1000-kva transformers and distribute it to motors, lighting transformers, and five Cabinetrol units. The Type AL-2 transformer secondary breakers and tie breakers are rated 1600 amperes, 50,000 amperes interrupting rating. Type AK-1 drawout air circuit breakers of 25,000 ampere interrupting rating are used to feed motors and Cabinetrol. Breakers for future circuits can be installed in spare compartments. G-E air circuit breakers have adequate "IC" (Interrupting Capacity) for short circuit protection, are easily removed for inspection.



# secondary-selective system using

# SWITCHGEAR

## continuity of service




At the new Fairfield Paper and Container Co. installation General Electric metal-clad switchgear receives the incoming 4160-volt power and distributes it to 4-1000 kva transformers for step-down to 480 volts. G-E metal-enclosed switchgear handles the 480-volt power through air circuit breakers of the drawout type. In general, all motors rated 60 hp and above are served by an individual breaker. Five Cabinetrol units are fed by air circuit breakers. Note that costly secondary feeders are short.

This secondary-selective system is only slightly higher in cost than a simple radial system, and provides Fairfield insurance against a complete shutdown in case of failure of any one transformer or its primary feeder cable. If trouble occurs the normally-open tie breaker is closed, thus providing an alternate source of power which permits the mill to operate at slightly reduced capacity.

**Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.**

## *here's why...*

***"When we planned our new facilities it was decided that a secondary-selective power distribution system would assure us of the continuous power, even in case of a major fault, needed for continuous-process operations like ours. We ordered G-E switchgear because their "metal-clad" protection safeguarded our employees, and because we could get all engineering, equipment and service from one organization. By dealing with one company we saved considerable time and money. The units arrived complete and we installed them in very little time."***

H. L. CUSTER, VICE PRESIDENT AND GENERAL MANAGER, THE FAIRFIELD PAPER AND CONTAINER CO., BALTIMORE, OHIO

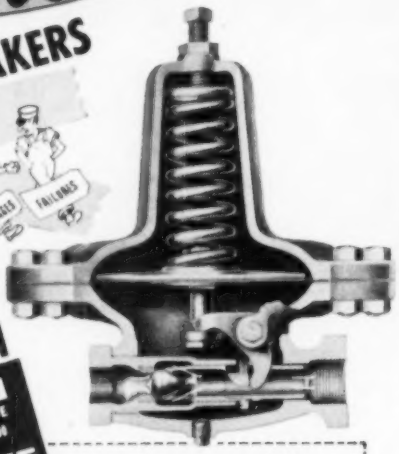
MODERN INDUSTRIAL **power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want proper voltage for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs. A complete system, using G-E switchgear, costs you less than a "piece-meal," makeshift affair.**

INVESTIGATE TODAY **the many advantages of using General Electric switchgear in *your* plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—or write for the helpful bulletins listed below. *Apparatus Department, General Electric Co., Schenectady 5, New York.***

| | |
|---|---|
| GEA-3083 | Metal-clad Switchgear |
| GEA-4966 | Low-voltage Metal-enclosed Switchgear |
| GEA-3592 | Load-center Unit Substations |
| GEA-3758 | Load-center Power Distribution |
| GEA-4057 | Interlocked-armor Cable for Primary Circuits |
| GEA-4352 | Flamenol Cable for Secondary Circuits |

GENERAL ELECTRIC

# IT'S GOODBYE Forever TO THESE TROUBLEMAKERS



## IN PLANTS EQUIPPED WITH CASH STANDARD Streamlined TYPE 1000 PRESSURE REDUCING VALVES

## The Reasons Why IT HAPPENS ARE TOLD BY USERS AS FOLLOWS . . .

### Check what the users say against the Benefit Points Below

• A Rubber Goods Manufacturer says—

"We have used these Type '1000' valves for several years with fine results on air or water service at pressures from 10 lb. to 300 lb. depending on requirements. These valves as claimed have been found to have **LARGE CAPACITIES.** On **FLUCTUATING LOADS** or **STEADY LOADS** they are **MOST DEPENDABLE, RAPID IN ACTION** with a **QUICK DEMAND** and **TIGHT CLOSING** when the load drops off. They require but a **MINIMUM OF SERVICE OR MAINTENANCE.**"

• A Chemical manufacturer says—

"The CASH STANDARD Type '1000' valves which we have in service have fulfilled the conditions checked . . . **(ACCURATE PRESSURE CONTROL UNDER TOUGHEST WORKING CONDITIONS), (TROUBLE FREE SERVICE), (TIGHT CLOSURE)** better than any other steam pressure reducing valves that we have used."

• A Metal Products company says—

"We have had a number of your CASH STANDARD Type '1000' valves in operation in our plant for a number of years. These valves have proved to be satisfactory in every respect. We particularly like this type of valve because it is **SIMPLE TO INSTALL, REQUIRES A MINIMUM OF MAINTENANCE,** and gives **CONTINUOUS** and **UNIFORM PRESSURE CONTROL.**

• A Plant Engineer says—

"We find that the CASH STANDARD Type '1000' streamlined valves are best suited for our various applications of compression molding because of their **VERY WIDE RANGE OF ACCURATE PRESSURE CONTROL.** The simplicity of construction of these valves has kept the **MAINTENANCE COSTS VERY LOW** which of course means a **SAVING IN COST OF OPERATION,** and **SPEEDIER PRODUCTION.**

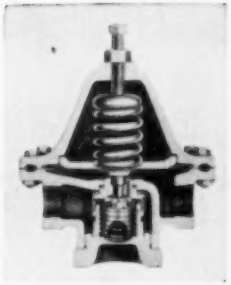
1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

*WRITE FOR BULLETIN 962*

CASH STANDARD CONTROLS . . . VALVES

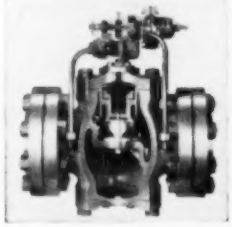
**A. W. CASH COMPANY**
DECATUR, ILLINOIS

• **BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES** *Send for them* •

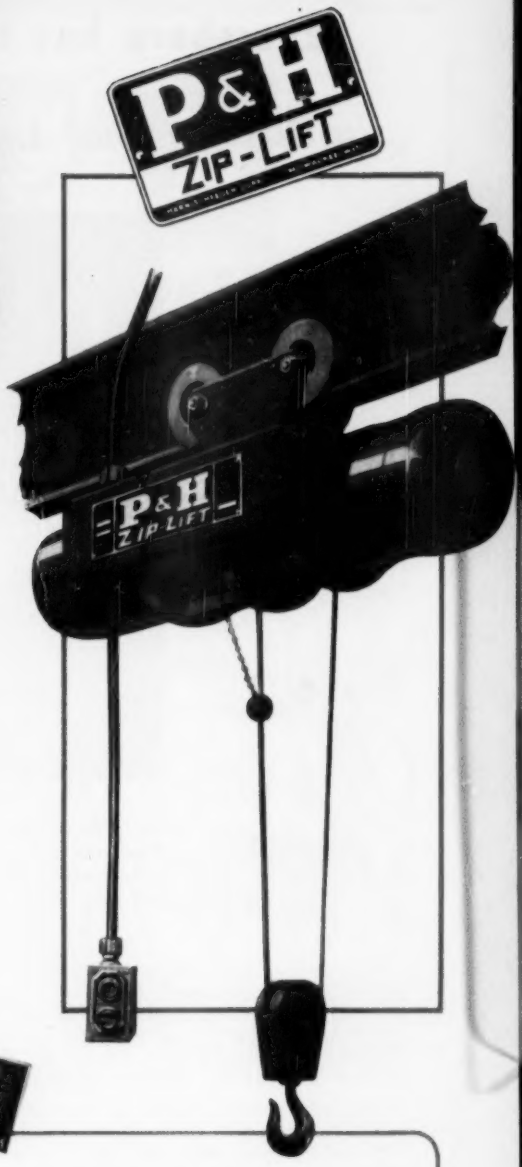


Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.




# LITTLE HOIST BIG VALUE!

**Save every time you use it!**

Next time you want to cut your departmental costs, think of the Zip! This small electric hoist costs so little — *saves so much* that you can't lose. You press the buttons: the Zip does the rest — with any load up to 2000 lbs.

The Zip-Lift gives you many extras, without extra cost. (Note the Added Values below.) In design, in power, in toughness, in dependability, the Zip adds up to America's finest small hoist — and the greatest small hoist value. That's what makes it the leader it is!

Write for this helpful booklet filled with practical cost-saving ideas. Ask for Bulletin H20-4!

*Handle it "thru-the-air" at lower cost*

**THESE ARE ADDED VALUES!**

**SAFER** — Full magnetic control with current reduced to 110 volts at the push-button. No open wiring. Plugging crane type limit switch and larger double brakes provide maximum safety.

**LIFETIME CONSTRUCTION** — Precision built — shaved gears running in oil — grease-sealed antifriction bearings — fully enclosed, moisture-proof, dust-proof, acid-proof.

**SMOOTHER OPERATION** — Motor specifically built for hoist service to withstand frequent reversal. Loads controlled within a fraction of an inch.

**ALERT SERVICE** — Out-of-stock delivery from qualified dealers everywhere — also backed by 18 branch offices and conveniently located warehouses.

*Available in capacities up to 2000 lbs.*

**P&H ELECTRIC HOISTS**

4682 West National Avenue
Milwaukee 14, Wis.

**HARNISCHFEGER CORPORATION**

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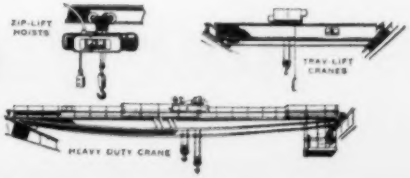


# Eversharp has the "write" answer...

## *in dust control systems . . .* it's KIRK & BLUM!

In the above photo, operators are buffing fountain pens already filled with ink. Note redesigned hoods which keep room clean and free from dust.

Known as a manufacturer of precision writing instruments Eversharp finds "clean air, the invisible tool," essential to efficient manufacturing operations. On moving one of its plants to Middletown, Ohio, this concern called in KIRK & BLUM to modernize and enlarge the dust control system.

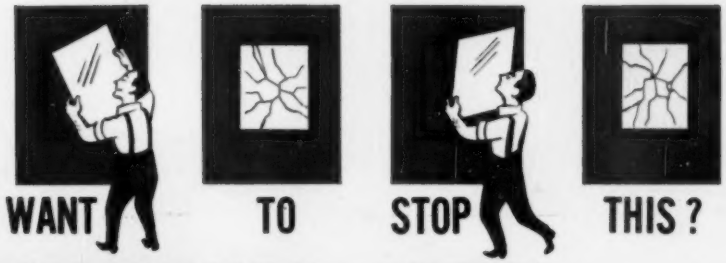
Among other changes, hoods on the buffing machines shown here were redesigned. Former bottom connections were used as traps and new connections were added at the top of the hoods. Note the compactness of hood arrangement and streamline suction piping in the limited space available.

If you suspect your present dust control system is out-dated and over-loaded, Kirk & Blum Engineers will gladly check it for you, making a no-obligation report. Write for free catalog, "Fan Systems for Various Industries." The Kirk & Blum Mfg. Co., 2889 Spring Grove Ave., Cincinnati 25, Ohio.

On the roof of the Eversharp plant, KIRK & BLUM relocated an old collector for greater efficiency and installed this new collector.

FOR CLEAN AIR . . . THE TOOL

**KIRK AND BLUM** DUST CONTROL SYSTEMS



# GLAZE WITH PLEXIGLAS

*Are you tired of the expense of replacing broken panes—often the same panes—day after day? Then look into the new idea—glazing with* PLEXIGLAS*—as did American Preserve Company, Philadelphia.*

Replacing broken panes at American Preserve Company, Philadelphia, with shatter-resistant PLEXIGLAS. Both clear and light-diffusing white translucent PLEXIGLAS are used in this maintenance-reducing procedure.

Twice a year, during the fumigation periods, American Preserve Company had to replace scores of panes which were cracked or broken. That was until they tried PLEXIGLAS. Now nearly 400 replaced panes are tough, acrylic plastic, and the use of PLEXIGLAS is standard maintenance procedure.

PLEXIGLAS is the newest idea in new construction, too. It's light (weighs only half as much as glass), has many times the impact strength of glass. It's shatter-resistant, easy to install, reduces heat transfer through windows.

Write today for full information about PLEXIGLAS for windows, walls, skylights . . . and wall-to-wall ceiling lighting.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

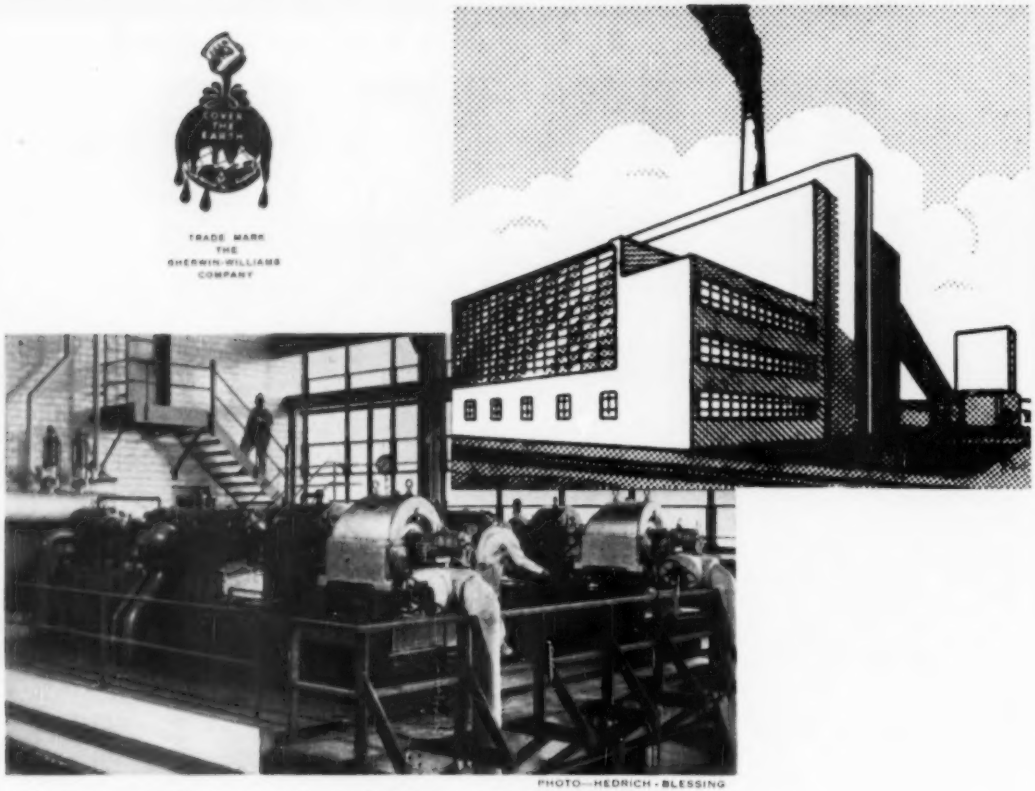
*Canadian Distributor:* Crystal Glass & Plastics, Ltd. — 282 St. Helens Avenue, Toronto, Ont.

CHEMICALS FOR INDUSTRY

**ROHM & HAAS COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

*Representatives in principal foreign countries*



PHOTO—HEDRICH-BLESSING

# SHERWIN-WILLIAMS INSTALLS FULLER ROTARY COMPRESSORS IN NEW BOILER HOUSE

Long delayed, due to difficulties encountered in obtaining materials and equipment during the war years, the much needed new boiler house of The Sherwin-Williams Company Chicago plant, was put into operation during the early part of 1947. However, this delay permitted further study and adoption of the latest techniques, and several unique dividend-paying features.

Fuller Company is justly proud to have been given the opportunity to supply two "lifetime-efficient" Fuller Rotary Compressors for this most modern and efficient industrial plant. These compressors are of the two-stage type, each having a capacity of 1592 c.f.m., free-air, at 120-lb. pressure, driven by 350 hp. turbines, equipped with speed reducer, to operate at 575 r.p.m. They furnish air for both factory and power house service.

Bulletin C-5, illustrates and describes Fuller Rotary Compressors and Vacuum Pumps. We'll be glad to send you a copy.

**FULLER COMPANY, CATASAUQUA, PA.**

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A LIFETIME OF NEW MACHINE EFFICIENCY

FULLER

C-179

# House of New Ideas

## FOR PRODUCTS AND SALES

Flintkote employs experienced technicians... Research Specialists who spend every working day tracking down new facts on materials and methods that can improve or broaden Flintkote's wide line of products for industry.

Housed in 24 separate, efficiently equipped laboratories... in one of the most modern buildings in the country... these technicians set the pace for Flintkote plants from coast to coast. This assures better products and better results consistent with lowest possible costs ... for you.

These researchers understand what makes business "tick," too. And they accept new product requirements as a recurring challenge. Also, the quality of our materials that have been in use for decades is carefully checked for today's applications.

So, if you are a user, or a potential user of Flintkote Industrial Products for construction, manufacturing or converting, remember that these trained specialists are at your service, to help find the solution to your problems. Full scale testing and pilot production methods are available under one roof. And, they'll follow through in your own plant if you wish.

Whether your requirements are coatings, adhesives, binders, floorings... asphalt, rubber or resin compounds... Automotive, Marine, Railroad, Construction, Building Maintenance products... see what we have now and can offer you for the future.

**THE FLINTKOTE COMPANY**
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**30 Rockefeller Plaza, New York 20, N. Y.**

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**Testing effective coverage of asphalt coatings. The metal plate with coating is grounded and a charge is placed in the metal bristles of the brush. Even the smallest rupture in the film produces a visible spark, indicating incomplete protection.**

**Among Flintkote's many products is a line of asphaltic spray-on sound deadeners to quiet metal vibration noises. In a specially-built sound-proof room, an electronic device measures the ability of various coatings to meet rigid specifications.**

**Summer and Winter climate, rain and burning heat are produced in the Research Laboratory. This Twin-Arc Weather-Ometer provides accurate control of accelerated weathering tests. Products designed for exposure must survive for many years.**

**This small mill is used to break down various rubber materials to the right consistency for use in new products or processes. Full size operation follows in the production of versatile fluid rubber and rubber-like adhesives, coatings and the like.**

**FLINTKOTE**

*Products for Industry*

# Why Westinghouse Repair Service means *lower costs for you*

The cost of maintaining your electrical equipment is more than just the first cost of the repair job and the parts. It includes all your expenses of maintaining continuous production.

When you figure these expenses, Westinghouse Repair and Maintenance Service saves you important money:

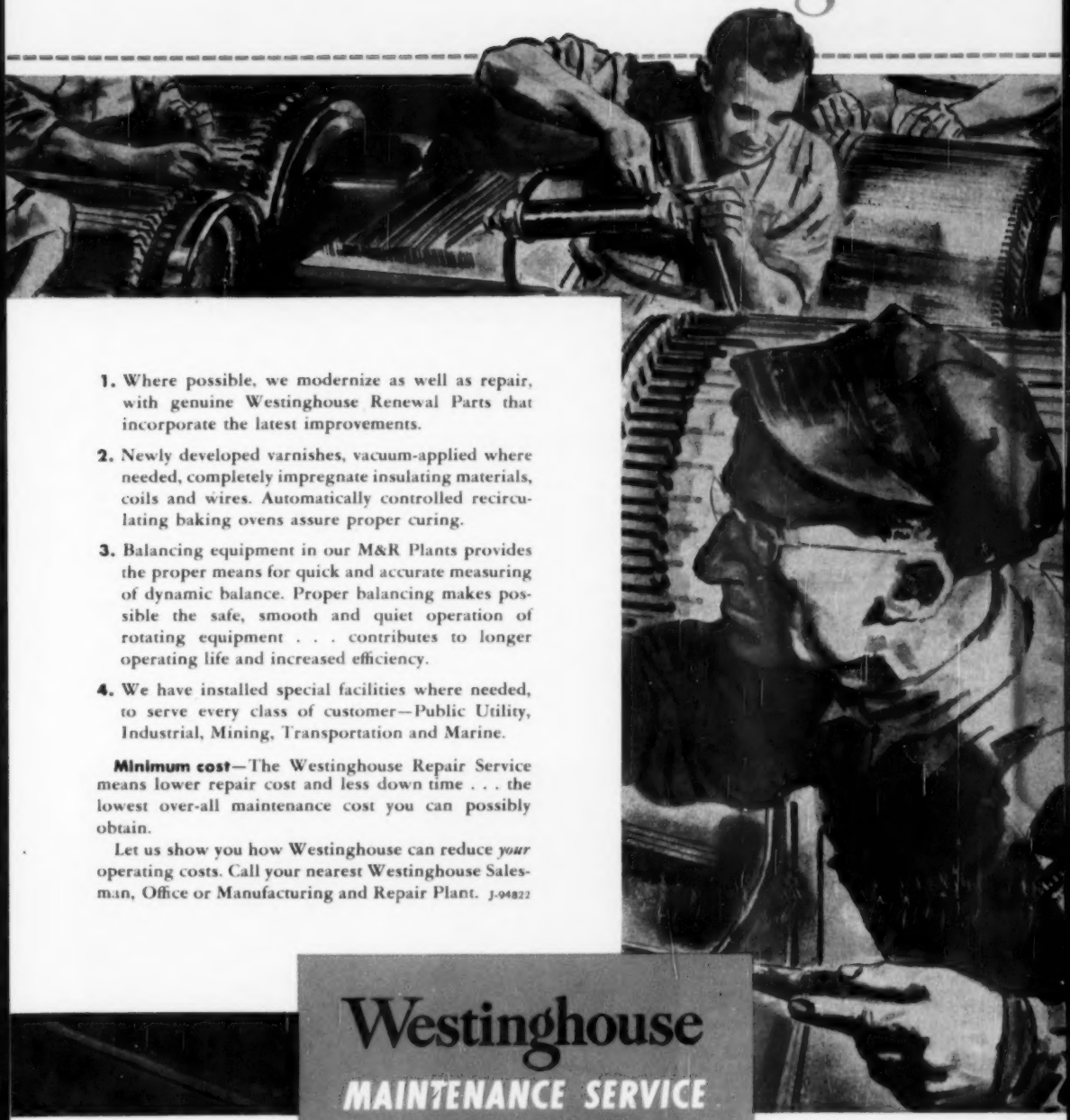
**Fair prices**—Our price schedules are set at a reasonable rate, made possible by our large volume of repair work. These prices are standardized throughout the country in our 36 Manufacturing and Repair Plants. Where needed, our Field Engineers make economical repairs in your own plant.

**Guaranteed repairs**—We guard against imperfections with rigid inspection standards, implemented with high-voltage, high-frequency surge comparative test equipment. With every rebuilding job goes the same one-year guarantee carried by new equipment.

**Top performance**—In repairing your equipment for top performance, we apply all new materials, tools and techniques developed throughout the Company. For example:

YOU CAN BE **SURE**.. IF IT'S

# Westinghouse



1. Where possible, we modernize as well as repair, with genuine Westinghouse Renewal Parts that incorporate the latest improvements.
2. Newly developed varnishes, vacuum-applied where needed, completely impregnate insulating materials, coils and wires. Automatically controlled recirculating baking ovens assure proper curing.
3. Balancing equipment in our M&R Plants provides the proper means for quick and accurate measuring of dynamic balance. Proper balancing makes possible the safe, smooth and quiet operation of rotating equipment . . . contributes to longer operating life and increased efficiency.
4. We have installed special facilities where needed, to serve every class of customer—Public Utility, Industrial, Mining, Transportation and Marine.

**Minimum cost**—The Westinghouse Repair Service means lower repair cost and less down time . . . the lowest over-all maintenance cost you can possibly obtain.

Let us show you how Westinghouse can reduce *your* operating costs. Call your nearest Westinghouse Salesman, Office or Manufacturing and Repair Plant. J-94822

## Westinghouse

## MAINTENANCE SERVICE

SHOP REPAIRS • FIELD REPAIRS

RENEWAL PARTS

# Plant Engineers' Digest

## The New Magnetic Material With a Brain

A NEW magnetic material is now commercially available in wound cores which are heat treated, cased and ready for use. The coils are wound toroidally (like a roll of Scotch tape) and the magnetic material from which they are wound is thinner than a human hair.

This material, known as Deltamax, has unusually good magnetic qualities. With these qualities, early application has been made in the production of contact converters and considerable interest has been shown in the field of magnetic amplifiers, which in many applications have been found to replace vacuum tubes advantageously.

Laboratory technicians have developed several ingenious circuits employing Deltamax cores. Most outstanding of these developments is the magnetic delay line. This is a circuit in which information can be stored in the form of magnetism until it is ready to be used. A chain of Deltamax cores is used to replace a large number of electronic tubes. An impulse corresponding to the intelligence being transmitted is impressed on the first core. A second impulse will bump the first impulse along to the second stage and so forth until all the impulses are stored simultaneously and consecutively in the line. This information can be made to circulate around a closed path and the intelligence can be removed and used at will.

It was also discovered that when a core of this material is given a shot of direct current, it will remember the magnitude and the direction of this d-c influence even after the same core has been subjected to an unlimited amount of alternating current. *From an article by W. S. Spring, of Allegheny Ludlum Steel Corp., in Steel Horizons, a publication of Allegheny Ludlum Steel Corp., Pittsburgh, Pa.*

## Spraying Cars Stops Ore From Freezing

ACCORDING TO C. A. Lindberg, supervisor of truck maintenance for U. S. Steel Subsidiary, The Oliver Mining Co., spraying the inside of stripping cars with a thin film of calcium chloride solution has proved the most effective means of stopping ore and stripping from freezing.

Calcium chloride has a lower freezing value than other materials the firm has tested and does not require any heat in application.

Mr. Lindberg said, "The method of application has been modernized, the mixture being pumped from the tank house where the mixture is prepared and stored, to a set of spray heads swung over the track and arranged with heads that throw a fine spray directed against the interior of the car.

"The solution in the tank house is adjusted for strength according to prevailing temperatures and can be kept in continuous circulation by the same pump that supplies the spray heads.

"The brakeman handles the control valve and the whole train is run through the spray at a speed of about two to three miles per hour without stopping the spray. The operation of spraying a whole train of six cars is completed in about three minutes." *From the November issue of Dowflakes, a publication of The Dow Chemical Co., Midland, Michigan.*

## New Uses for Fly Ash

THE MOST recent application for fly ash is its use in the field of soil stabilization, with particular emphasis upon road construction. A mixture of limestone screenings, fly ash and a small amount of hydrated lime has been developed for use as a base course for supporting a concrete pavement and as a cementatious fill to replace the customary limestone screenings normally used as the base course for bituminous concrete pavement. Experimental installations of this type construction have been made, but as yet these installations have had insufficient service to definitely prove its superiority over standard construction.

Another fly ash application is its use in insulating cements, building brick and in steel foundries to provide hot strength for core and molding sand, as a replacement for silica flour. When used in the making of cement, a remarkable lack of shrinkage was noted when the cement had dried, and there was excellent adhesion to base insulating materials. Due to the high adhesion and low shrinkage, a single coat could be applied without the use of wire mesh reinforcement. Paint can be applied directly to the furnishing cement without the usual canvas jacket. This cement will successfully withstand temperatures up to 1700 F, which would permit its use for turbine insulation.

Fly ash in concrete offers the following advantages: reduced temperature rise, reduced thermo and drying shrinkage, increased workability, resistance to freezing and thawing, resistance to sulphate attack and additional gain in

## Corn Cobs Dry Clean Electrical Apparatus

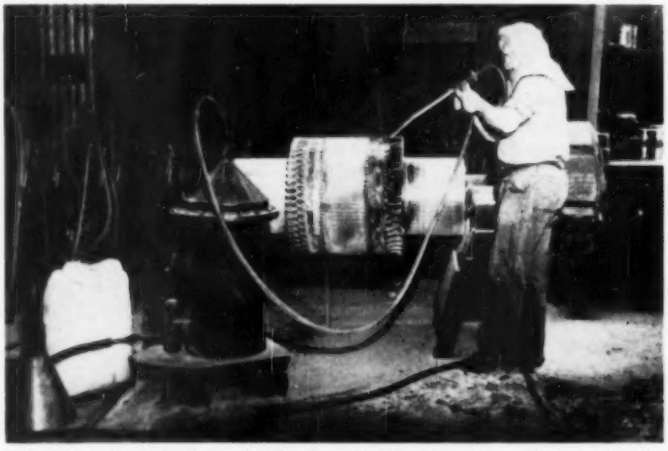
PRECAUTIONARY measures are required in the present day methods of cleaning electrical apparatus. However, a new method is appearing on the scene in the form of ground corn cobs.

It has been found that the inclusion of vegetable substances such as corn meal, bran, hominy grits, etc., directed under pressure against the equipment being cleaned produces, not only the new look, but new results.

First experiments with this material tended to prove ordinary corn meal was the best material for this purpose but further experimentation has disclosed that finely ground corn cobs are greatly superior. The cost of this material is approximately 25 per cent of the cost of corn meal.

By use of a conventional siphoning arrangement, the granulated corn cob material is introduced into the air stream (at about 30 lb pressure) and then thoroughly blown through all the openings in the armature windings and commutator assembly. By regulating the air pressure and the amount of granulated corn cobs used, the operator is enabled to provide and direct the cleaning medium in properly related quantities to efficiently clean.

After thoroughly cleaning the apparatus in this manner, it is then blown out with air only, to remove partially lodged particles. *From an article by Ed. Shoff, in Maintenance News, a publication of Westinghouse Electric Corporation, East Pittsburgh, Pa.*



**This new process is shown in the dry cleaning of a rotor. The operator is equipped with a hood and applies an atomizer action**

ERIEZ MAGNETIC AGE

Issued periodically in Erie, Pennsylvania, by the Eriez Manufacturing Company, Producers of Magnetic Equipment.

## MILLERS EVERYWHERE HAIL ERIEZ SEPARATORS

In hammer mills, attrition mills, corn cutters and other milling equipment from coast to coast Eriez Magnetic Separators are protecting machines and animal feed from the harmful effects of tramp iron.

Some interesting excerpts from users' letters to us follow:

". . . it has more than tripled the life of the screens . . ."

". . . it was in the hottest part of the fire and we thought it was ruined . . . we put it back . . . and it is still giving good service."

". . . 78 shingle nails out of 10 sacks of grain . . . money could not buy our Eriez Separators."

But why go on? That's the way most people feel about Eriez Separators.

For information on milling applications, circle the number 4 on the coupon at right below and mail to Eriez.

## TEXTILE MANUFACTURER SAVES $5000/YR. MAINTENANCE COSTS

W. L. Bailey, Superintendent of the Cotton Department of Upholstery Supply Co., San Francisco, says of Eriez Separators:

"I made a test for a year on six garnett machine feeders and we got 37½ pounds of tramp metal, so you can see how much they saved on repairs alone. I feel I would be safe in saying that at least $5000 a year is what we save . . . not counting down-time."

And down-time is often the most serious consequence of a breakdown in production.

Close-up of Eriez spiked apron mag net swung back for cleaning.

Opening-room fires are a particular nuisance in the textile field. The hazards are great, especially on night shifts, when limited emergency crews are available. The extent of the danger is shown by one southern cotton mill reporting 22 opener picker fires in a single year! Eriez Magnetic Separators eliminate this hazard quickly and efficiently.

For more information on textile applications, circle the number 5 on the coupon at right and mail to Eriez.

# "X" Marks a Danger-Spot for Chemical Processing Equipment

The Eriez Electronic Metal Detector puts the finger on tramp metal, ferrous or other, passing through your processing lines.

Detection of the metal is by electronic means. Location and elimination may be arranged by any means best suited to the product in process.

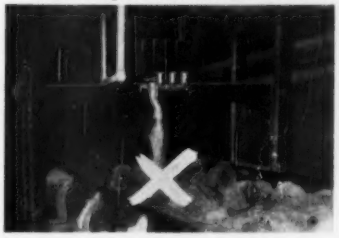
Audible signals, visible signals, reject arms and other devices are used in Chemical processing. Removal of the offending material is mechanical or manual depending on size and weight.

In the picture shown the Eriez Detector stops the line and marks the location of a chunk of tramp metal which would wreck jaw crushers and shut down the production line for days. This installation paid for itself in 2 months of operation.

The search coil of the Eriez Detector is custom built for conveyor lines of any size, type, or material. It is adjustable for any minimum size of material, operates with efficiency at any depth of burden, and at conveyor speeds up to 900 feet per minute.

The Eriez Metal Detector is a technical electronic device. Our engineers plan and design your application; then again supervise installation, making the necessary adjustments to assure perfect operation.

For more information circle the number 1 on the coupon below and mail to Eriez.



## FOUNDRY SAVES MONEY

R. V. Shaffer, Asst. Factory Mgr. of the Dayton Steel Foundry Company, is elated at the success of his Eriez Magnetic Separator in removing steel shot and other metal pieces from foundry sand to avoid damage to machinery.

The installation is a magnetic pulley 12" in diameter carrying a 16" belt, a type widely used in foundries and other metalworking plants.

Magnetized bars run lengthwise of the pulley and create a magnetic field through the belt which carries the material to be cleaned. Non-magnetic sand falls off the belt as it passes the tangent point of the pulley, while the metal clings to the belt until it is carried out of the magnetic field, then falls into its own bin.

For more information, circle the number 2 on the coupon below and mail to Eriez.

That's where our magnetic equipment engineers come in, if you'd like.

No obligation, of course, when you ask for a survey of magnetic equipment applications in your business. On our part: no strong-arm selling; you'll get a thorough, honest appraisal of your *exact* requirements explaining how the equipment can provide you with a profit.

For more information, circle the number 3 on the coupon below and mail to Eriez.

### Hope to See You at the Plant Maintenance Show

*Eriez is featuring magnetic equipment for maintenance efficiency at the Plant Maintenance Show in Cleveland, January 16 to 19. Eriez engineers and other trained representatives will be on hand to answer technical and practical questions about magnetic equipment.*

## PLANT SURVEY DETERMINES MAGNETIC EQUIPMENT NEEDS

There are said to be over 20,000 uses for magnetic equipment. These include such varying uses as removal of tramp iron to forestall fire or mechanical damage, separation of microscopic iron which might contaminate the product, substitution of magnetic for mechanical actuation.

Most manufacturing people know of these uses but there are scores of others known to but few people. Could be that some of them are right in your plant.

ERIEZ MANUFACTURING COMPANY
204 State St., Erie, Pa.

Name .....

Street .....

City ..... State .....

Company Name .....

1. 2. 3. 4. 5. 606

strength at later ages. *From a release of The American Society of Mechanical Engineers, New York 18, N. Y.*

This material is being used in the construction of Hungry Horse dam on the Flathead river in western Montana.—Editor

## Plant Without Walls

WHEN a refining company set out to build a new plant in the West, it wanted to find some new solutions to the old problems which have always plagued the grain-processing industry—explosive dust and dangerous fumes.

The engineering contractor decided that the best way to eliminate dangerous working conditions within enclosed spaces was to build without walls.

Thus, some of the 21 buildings in the sorghum processing plant have no walls; some have no roofs either. Typical are the millhouse and the "steep house," in which grain is placed in large wooden tanks for treatment in a dilute sulphuric acid solution. The sea breeze keeps the steep house clear of choking sulphur fumes. The breeze also sweeps clean the floor under the silo conveyor belt, usually a collection spot for explosive dust. *From Time, the Weekly Newsmagazine, Nov. 7, 1949, New York 20, N. Y.*

## Jet Eductors for Handling Gasoline Dyes

A SUBJECT to which a number of refiners have been giving some thought and study is the handling of gasoline dyes. One system which has attracted interest is the use of a jet eductor to transfer the dye, with the gasoline blend serving as the driving fluid.

In actual operation, a container of dye is placed on a scale and weighed at the start of the process. If 300,000 gal of motor fuel are to be dyed—and the dye requirements are 1.5 g per 100 gal—then 4,500 g, or about 10 lb, of dye are necessary. With the proper color dye on the scale, the operator notes its weight and the reading at which he should stop the addition of dye. He inserts a flexible hose into the dye container, opens the eductor valve, and draws up the proper amount of dye.

Only a small fraction of those 300,000 gal of motor fuel, of course, goes through the eductor. After the required amount of dye has passed through the eductor, "wash" gasoline is flushed through the eductor and its connecting lines, to clean them out. From then on, the balance of the mixing operation is completed in the storage tank.

The jet eductor used is of 1¼ in. pipe size. Both the pressure and return lines form risers at each eductor location. Each riser is fitted with a valve, and above these the jet is mounted. On the suction side of the jet there is fitted a short nipple containing a bleeder and vacuum gauge connection. Above these, the suction line is equipped with a blending device, a quick-closing valve, a counter balance swivel joint and, finally, a flexible hose of synthetic rubber to actually pick up the dyes.

Separate eductors are employed for each color of dye used for both motor and aviation gasolines, in order to avoid improper mixing of dyes. Individual scales are used for each color of dye to avoid mutiple handling of dye barrels and also permit more sensitive scales to be used on colors required only in small quantities.

A corrugated asbestos and steel building houses the dye plant, complete with storage space for dye inventories. The floor of the building is at truck-bed height, to facilitate the handling of dye containers. The larger scales are set in pits to make their platforms flush with the surrounding floor, thereby permitting the handling of barrels with a warehouse truck. Windows in the building are permanently sealed, to avoid drafts. The concrete floor is

## Servicing Plant Heating Systems Systematically

HERE ARE listed a number of helpful steps that will apply to practically every heating system whether it's a domestic system or one serving a large industrial plant.

**1. Clean flues**—First, on any heating system inspection, is the boiler. Flue cleaner mechanism should be used to assure a thorough job. A tag should be placed on the stoker to indicate maintenance work to be done before the boiler can be put into operation. With the flues clean be sure to check the stack and chimney clean out.

**2. Check tubes**—Check the condition of the interior of the boiler for lime, mineral and other deposits left by the boiler water.

**3. Oil motors**—All motorized equipment should be checked for proper operation and oiled for the coming season. Be sure not to overoil the equipment.

**4. Check trap performance**—Check the traps on the equipment for proper operation by feeling the return line from the trap. If the pipe is just warm to the touch, the trap is operating efficiently. A hot pipe indicates the trap is passing steam and should be repaired. At the same time the trap is serviced, the maintenance man should also open and clean the strainer. If he notes the presence of large amounts of dirt, dirt pockets should be opened and drained.

**5. Unit inspection**—Checking the motors on the various units is part of each inspection. Check unit supports along with fan operation and make general check of complete unit.

**6. Clean filters are important**—Filters should be inspected frequently and replaced with clean or new ones when needed. A regular inspection period for filter checks should be set. A supply of extra filters should be held in reserve.

**7. Belt tension**—Before putting the air handling equipment into operation check the tension and condition of belts. This should be done at the same time that filters are checked, motors oiled, humidifiers cleaned and damper linkages and motors inspected. Snug belts assure efficient performance of the fans. *From an article by K. E. Sontag in Weather Magic, Oct. 1949, a publication of The Trane Company, La Crosse, Wisconsin.*

Fig. 1. Maintenance man removing cover for servicing, showing working parts which can be inspected and serviced without the necessity of removing the trap from the lines

Fig. 2. Trap performance is checked by maintenance man by feeling return line from the trap. If warm, trap is operating efficiently; if hot, trap is passing steam, and should be repaired

Fig. 3. Filters are an important item on the serviceman's check list and should be checked periodically. Keep reserve supply of filters in maintenance stores at all times

# WICKWIRE ROPE

A PRODUCT OF CF&I

## Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® Preformed. It lasts longer—is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

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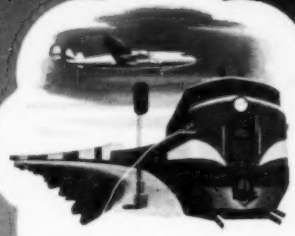
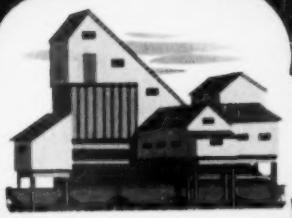
500 Fifth Ave., New York 18, N. Y.
IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1060—19th Ave., Oakland 6, Cal.

LOGGING



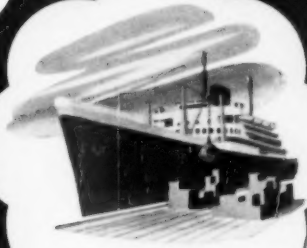
TRANSPORTATION



MINING

PETROLEUM

MANUFACTURING



MARINE

CONSTRUCTION

sloped to a drain, in order to facilitate washing down.

This system is advantageous in that dyes can be weighed accurately, time is saved by eliminating dye solution step, turbulence in eductor and loop lines provides sufficient mixing to put the dyes into solution. And, finally, it provides ease of operating and cleaning, adequate facilities for storing and handling bulk dyes, and economical operation. *From Ethyl News, October, 1949, a publication of Ethyl Corporation, New York 17, N. Y.*

## Test Results of Silicone Motor Insulation

IN RECENT TESTS a comparison was made between the behavior of class-B and class-H insulations under the same test conditions. Class-H and class-B insulations are both composed of inorganic materials such as mica, asbestos, and glass fiber; the difference lies in the resins and varnishes used as bonds and impregnants. Class-B insulation employs organic resins, whereas class-H insulation employs silicone resins. The fundamental concept followed in this test program was that appreciable decrease in the humidified insulation resistance of windings is a criterion of minimum insulation life.

Nine motors were subjected to accelerated life tests—six 10 hp induction motors with class-H insulation treated with silicone (DC 993) varnish, two class-B insulated induction motors of similar design, and one d-c motor with class-H insulation treated with DC 993 silicone varnish.

The conclusions reached from this investigation are:

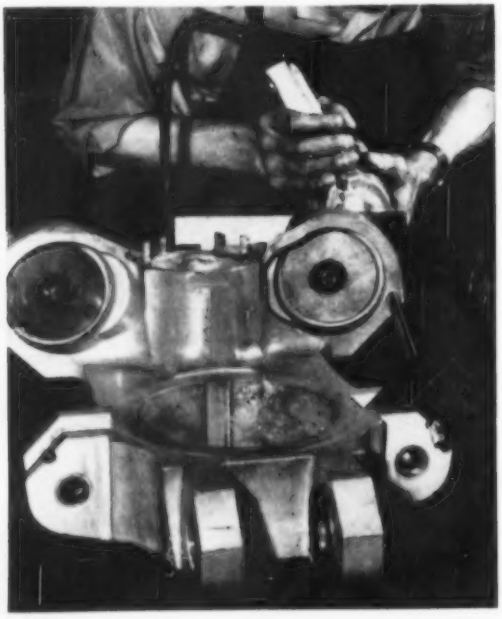
1. The minimum insulation life points, determined by electrical measurements, and serious crazing of the resin often occur simultaneously. 2. Failure of class-H insulated motor windings occurred before the bonding of the silicone resin was seriously weakened. 3. Silicone insulation presents less fire hazard than other classes of insulation. 4. The minimum thermal life of class-H insulated equipment using DC 993 silicone varnish is approximately twice that of inorganic insulating materials bonded and impregnated with the original, and now obsolete, DC 990A silicone insulating varnish. 5. The results of the tests indicate about a 100 C temperature advantage for class-H insulation compared with class-B insulation. 6. Several years of continuous operation at hottest spot temperature of 220 C will be required to reach the minimum thermal life of class-H insulated equipment. 7. The maximum life of class-H insulation was not determined by these tests, since the ultimate end points were the results of copper conductor failure rather than mechanical disintegration of the resin. *From an article by G. L. Moses, Manager, Development Insulation Section, Westinghouse Electric Corp., in Westinghouse Engineer, a publication of Westinghouse Electric Corporation, Pittsburgh, Pa.*

## Does Anyone Want to Make Some Half Holes?

"HALF-HOLES", formerly rasped out with a file, now are being drilled with an electric drill at Texas Engineering and Manufacturing Company, Inc., Dallas, Texas, and as a result, not only has the time required for the operation been reduced 50 per cent, but the holes are cleaner and more uniform.

The change in procedure was made possible by the development of a special "half-hole" drill jig. The "half-holes" are part of a C-54 nose-gear modification resulting from a reconditioning operation, and are cut out of the steering collar to make room for a tension bolt. The jig for cutting this groove with a drill instead of a file consists of a steel plate and block which are quickly attached with locating pins to provide a two point guide for the drill.

The half-hole drill jig eliminates hand work yet does not involve the excessive set-up time which would be required to perform the operation on a mill. *From a recent release from Texas Engineering and Mfg. Co., Dallas, Tex.*



L. H. Perdue drills a "half-hole" in a C-54 nose-gear steerings collar using the special jig devised in the machine shop at his plant. A completed half-hole may be seen on the left

## Paint Remover Par Excellence

A RECENT report from Wright-Patterson Field describes a paint remover which solves the problem of removing highly-resistant aircraft camouflage enamels. The product is sprayed onto the painted surfaces. It removes almost 100 per cent of the paint, in contrast to the 90 to 92 per cent effectiveness of previous materials.

According to the report the solution remains stable in storage up to six months, is non-corrosive, and washes off easily under high pressure water. This remover makes possible the cleaning of camouflage paint from a giant C-47 transport in half a day. The basic formula is as follows:

| Ingredient | Percentage By Weight |
|---|---|
| Methylene Chloride | 76.5 |
| Methyl Alcohol | 6.5 |
| Cellosolve | 4.0 |
| Methyl Cellulose | 2.0 |
| Wetting Agent | 5.0 |
| Paraffin Wax | 3.0 |
| Water | 3.0 |

*From The Coating Corner, a publication of Brooklyn Varnish Mfg. Co., Inc., 50 Jay St., Brooklyn 1, N. Y.*

## Ceramics for Turbine Blades

CERAMICS and metals can now be combined to make a new material for turbine blades which promises to increase the temperature, and thus the efficiency, at which gas turbines for aircraft and other applications can operate. Ceramic materials have been widely used for linings and non-moving parts of gas turbines, but for use in moving parts they are too brittle and subject to cracking with quick temperature changes.

Standard powder metallurgy techniques are usually used in the fabrication of cermets (also called "ceramals" and "metamics"). The metal and ceramic grains are milled together to the desired size, and are frequently held by a temporary binder, such as wax. The pieces are then pressed in molds at a pressure of 10,000 to 100,000 psi. The wax is burned out at a relatively low temperature, and the final firing is in the temperature range between 2500 F and 3000 F.

The possible metal-ceramic combinations are almost endless. The ceramics include borides, carbides, oxides, spi-

# Republic Air Hose establishes preference for underground iron mine work

*Mr. W. K. MacAskill, President*
*MacAskill-Monaghan Company*
*Duluth, Minnesota*

● One of the world's largest iron mines recently voted Republic Champion the best available air hose for use with underground power loaders. Selection was made after a series of tests proved it outperformed all other competing hose.

Republic Rubber and its Duluth Distributor, the MacAskill-Monaghan Company, recommended Champion Air Hose for this work because it is ruggedly built and withstands the most abusive operating conditions.

Champion is a flexible hose of great strength, having exceptional resistance to pulsating and high working pressures. Special high tensile cord encloses the oil-resistant Reprene tube and a thick, highly resilient, low gravity, tan cover protects the hose against abrasion and shock. Champion is also available with a yellow safety cover that makes it plainly visible even in underground operations.

Republic Rubber makes 840 different types of hose for every need. Like Champion, each is designed to give longer service life per dollar invested.

Consult your nearby Republic Distributor today. He can help you select the very best hose for your particular need.

Remember, Republic Rubber has been *the* specialist in the mechanical rubber goods field for more than 48 years.

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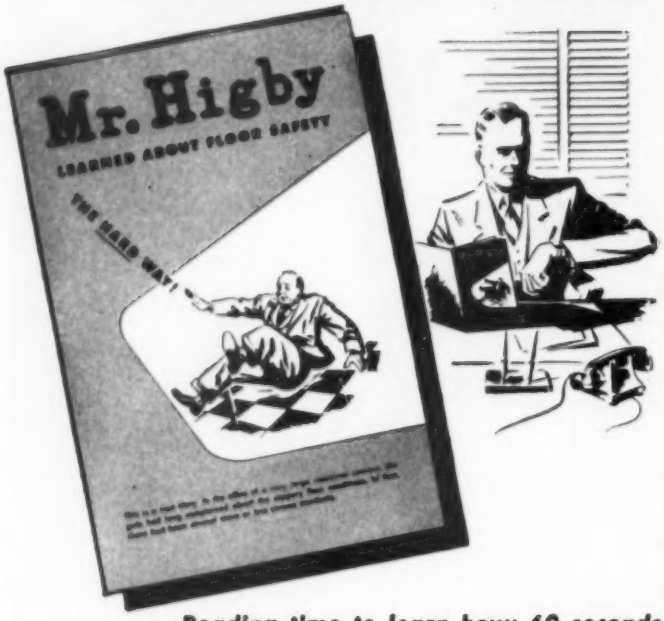
# This book...in 10 minutes... prevented 1037 accidents!

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Of course there was more to it than that. But it started when the office manager of a prominent company read a copy of *Mr. Higby Learned About Floor Safety the Hard Way.*

In its pages he learned the solution to a long-standing problem: a waxed office floor hazard that was claiming 4 or 5 slip victims week after week. The result: a way to keep his floors so slip-resistant that in five years since (when 1040 falls might have occurred) *there have been only 3 slip accidents.*

If you've searched for an answer to slippery floor accidents, perhaps this booklet can help you, too. In plain talk it explains the whys and wherefores behind the care of floors. It tells how to avoid slippery floors, and how the Legge System of Safety Floor Maintenance can help you. And it shows you how to eliminate waste motion in floor upkeep to save precious dollars.

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Types of flooring_____

Area_____ sq. ft. PB-8.

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*of Safety Floor Maintenance*

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nels, or combinations of these, while the metal could be almost any of the heat-resistant metals or alloys. Only a few combinations have been tested thus far.

To date only a few actual turbines using cermet blades have been tested, and the results have not been conclusive.

When and if future techniques are perfected, applications outside the gas-turbine field will probably be found. A possible one is in shearing knives for metallurgical operations, which require high abrasion resistance at elevated temperatures. Valve seats which can be ground smoothly and have good compressive strength are perhaps another place where the cermets may be important. *From Industrial Bulletin, a publication of Arthur D. Little, Inc., Cambridge, Mass.*

## Maintain Check Valves of Fire Protective System

FIRE protective systems at some plants have one source of water from the public system and another from an interconnected private source which is unapproved for drinking. The non-potable supply might be a fire pump supplied by a pond, river or a private well.

Public health regulations in many states permit these cross connections to be retained if specially designed check valves are installed and maintained absolutely tight to prevent possible contamination of the public water. In accordance with trends in public health measures, it is not recommended that new cross connections be between potable and non-potable supplies.

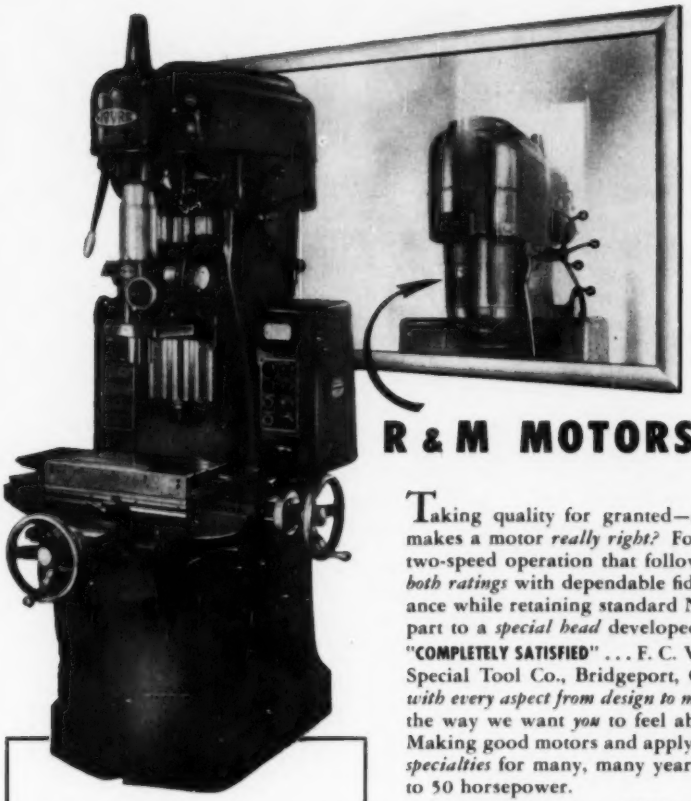
The usual protection for cross connections, approved by the health departments of a number of states, consists of two all-bronze check valves having molded rubber facings to prevent leakage. The double check valves are installed between gate valves, in the connection between the public main and the plant fire protective system. Test drains and gages enable tightness to be quickly verified.

Tests for tightness should be made monthly by the plant maintenance force. In addition, the valves should be thoroughly cleaned internally about once a year in order that they will continue to be absolutely dependable. At this time the rubber facings should be washed, carefully examined, and replaced if not in perfect condition. The facings deteriorate with age, and should be replaced every six years regardless of their outward appearance. *From Factory Mutual Record, Nov. 1949, a publication of the Factory Mutual Engineering Division of the Associated Factory Mutual Fire Insurance Companies, Boston 10, Mass.*

## Where to Locate Anodes for Cathodic Protection

THE LOCATION of magnesium anodes for cathodic protection is largely dependent upon whether the surface to be protected is bare or well coated.

For bare pipe where long lengths are to be protected, unless conditions are unusually favorable, the anodes should be located at least 10 ft from the line with maximum spacing be-



The No. 2 Moore Jig Borer. Its standard R & M two-speed motor delivers 2 h.p. at 1725 r.p.m.; 1 h.p. at 850 r.p.m.—with dependable fidelity.

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**"COMPLETELY SATISFIED"** . . . F. C. Victory, Chief Engineer of Moore Special Tool Co., Bridgeport, Conn., says, "*Completely satisfied with every aspect from design to motor performance.*" That's exactly the way we want *you* to feel about the services we can render. Making good motors and applying them right have been *R & M specialties* for many, many years. Sizes range from 1/200th up to 50 horsepower.

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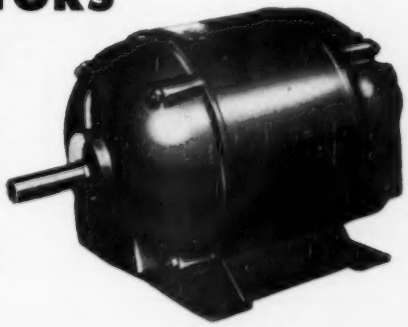
# R&M *Uni-Shell* MOTORS CUT MAINTENANCE



R & M Uni-Shell Motors are as good as they are good-looking. One-piece steel shells—*introduced by Robbins & Myers in 1939*—are rigid; won't break. Phase groups, as well as coil groups, are individually insulated for *added protection.* Bearings are pre-lubricated—double-sealed—go years without re-greasing. For cool operation, inside and out—for dependability and stamina—it will pay you, too, to *standardize* on R & M Uni-Shell Motors. Sizes: 1 to 50 h.p.

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tween anodes of not more than 50 to 75 ft. Where only short lengths of less than 1000 ft are involved, however, anodes should be installed within two to five feet of the line. This latter procedure will minimize end losses by concentrating a larger percentage of the current developed on just that section of line under consideration.

On bare pipe having an area of two square feet per running foot and requiring one milliampere per square foot for protection, anodes should be spaced about 50 ft apart if the average current flow per anode is 100 ma. Where spacing between anodes of 10 ft or less is indicated, an effect known as interference, mutual resistance effect or decrease in paralleling efficiency is encountered. Under such conditions—with large pipe or high current densities—some loss can be avoided by installing anodes along both sides of the pipe and staggering the installations.

Where anodes are closely spaced, as on bare pipes, it is not necessary to provide an individual connection between each anode and the pipe. Instead, the anodes may be connected in banks of five to 20 or more by means of a collector wire which parallels the pipe line and is connected to it every 200 to 1000 ft. This decreases installation costs without affecting performance.

On coated pipe lines, where current distribution is controlled primarily by the resistance of the coating, anodes may be spaced several hundred feet to several miles apart, depending on the condition of the coating. Such conditions permit grouping of anode installations at the most convenient or effective locations along the line—at valve boxes where connections to the pipe already exist or are easily made, or in low resistivity soil where large current flows are readily obtained. Normally, the number of anodes in any one group should not exceed four except where longer life is desired. *From Dowell Magnesium Anodes, a publication of Dowell Incorporated, Tulsa 3, Oklahoma.*

## New Laboratory Construction Will Benefit Research

ONE OF THE most modern and completely equipped laboratories is being constructed in Detroit. Since the late 1930's General Motors' research experience and know-how, has been handicapped in many instances by lack of sufficient space, inadequate facilities, vibration, city codes, and what-not. Research management recognized this handicap and made preliminary studies on new facilities. The final result was the proposed construction of four buildings.

The Metallurgical Building, now under construction, will be 320 ft long and 110 ft wide. A center area measuring 50 ft wide and extending 230 ft from one end of the building will be devoted to our foundry and metallurgical pilot plant work. This foundry section will contain electric and gas furnaces and a large molding and pouring floor. Sufficient space will be available to install a cupola, if we see fit at a later date. Surrounding this area, we will locate other allied foundry and metallurgical equipment such as ovens, presses, quenching tanks, and generators.

*(Continued on page 28)*

# Bulletins on Current Plant Problems

## ELECTRICAL

**101** Manual of System Planning, Preventive Maintenance—This 96 pp book is probably one of the finest pieces of technical literature ever issued for plant engineering department. Too comprehensive to describe in this space, suffice it to say that the book covers the complete story of electrical system planning and preventive maintenance. Chapter heading, which will best indicate the scope of the manual are, in part: System Functions; Code Reference Chart; Voltage Drop Tables; Power Factor Charts; Guides for Motor Wiring; Guides for Lighting Wiring; Electrical System Records; Supplementary Feeder Schedule; Preparing Electrical Plans; Switchboard and Feeder Schedule; Riser Diagram of a Complex System; Motor and Control Schedule; Symbols for Wiring Plans; Preventive Maintenance; P. M. Tools; P. M. Pointers; Diagnosing System Conditions; General System Survey; Load Survey; etc. It is exceptionally well illustrated and arranged. Anaconda Wire & Cable Co.

**102** Distribution Duct Engineering Data—Bulletin 427-4 contains 32 pp of dimensional data for estimating ventilated duct for feeder circuits, plug-in duct, and plug-in duct for branch circuits. Illustrated throughout, the book also contains useful information on bus duct, instructions for laying out distribution duct jobs and pointers on estimating. Two pp are devoted to diagrams and symbols used in layouts. BullDog Electric Products Co.

**103** Cable and Wiring Data Book—General Catalog 500 offers extensive technical data on company's electrical cable, building wire, and conduit raceways. Bound in leatherette, this 96-pp book also contains information on electrical engineering and wiring standards. Includes a photographic "trip through the plants" to show the organization back of the product, describing and illustrating facilities for hot rolling rods, wire drawing and other processes. Catalog makes use of a coded stock numbering system covering all items and designed to speed paper work and minimize risk of error in specifying, ordering, manufacturing and distributing operations. Presents some newly introduced building wire and non-metallic sheathed cable, thermoplastic covered and Neoprene covered wire, underground service wire and cable, and varnished cambric, high voltage and power cable. Data on armored cable, flexible steel conduit and rigid and thin wall conduit are also provided. Triangle Conduit & Cable Co., Inc.

**104** Capacitor Motor—Bulletin GEA-5401, 12 pp, presents company's new integral horsepower, single-phase capacitor motor, illustrating and discussing its compact size, transfer mechanism, bearings, and terminal board. Emphasizes long service and protection against damage, breakdown and operating wear afforded by the motors. Also stresses easy installation and quiet operation and explains company's motor exchange plan. Gives specifications, characteristics of motor and elaborates on construction features. Apparatus Dept., General Electric Co.

**105** Insulated Cable—Four-pp Bulletin 5478 presents and explains the reasons why company's insulated cable suits wiring costs. Also lists design features and practices now in common use in which company pioneered. Rockbestos Products Corp.

## MATERIALS HANDLING

**106** Handling and Processing Equipment—This comprehensive Catalog 701, 32 pp, covers company's line of feeders, bin valves and level indicators, reduction machinery, vibrating screens and processing equipment, magnetic separation, elevating and conveying machinery, barrel packers, electrical controls for vibrating units, also chains and transmission machinery. Illustrated with photos and sketches of units and installations, the text covers typical applications and advantages of the equipment, explains operation and gives general specifications and sizes. The Jeffrey Mfg. Co.

**107** Conveying Systems Manual—The unloading and conveying of dry pulverized material is discussed and illustrated in 24-pp Bulletin PE-36. Text covers the complete system and its operation, also the stationary pump and related equipment and is illustrated by photos and dimensional drawings, with available sizes listed. Conveying equipment installed in mining plants, cement plants, foundries and other industries is described and pictured. Also presents company's air compressor for use with conveying systems and remote-control unloader. Fuller Co.

**108** Belt Booster—Bulletin P-37-A1 illustrates and gives specifications for a portable and reversible elevated belt booster. Unit is pictured at both minimum incline and fully elevated positions. Leland Equipment Corp.

**109** Conveying Units—Illustrated Bulletin 32 presents application data and specifications on a portable belt conveyor unit for level or incline use, designed to speed package handling and for use alone or with other conveyor equipment. The E. W. Buschman Co., Inc.

**110** Materials Handling Equipment—Here is an excellent collection of bulletins covering manufacturer's line of trucks and tractors for excavating, earth-moving, and bulk-material handling. Filled with illustrations, these bulletins show what each model is built to do, how it operates, what its special advantages are. Capacities, specifications included. The Frank G. Hough Co.

**111** Pointers on Positioning—This excellent 16-pp booklet "Material Handling - at the Machine," shows how proper positioning of materials can save unnecessary handling during production operation. Contains illustrations and descriptions of 13 types of positioning equipment of various manufacturers. Two illustrative process charts are given as examples for determining extent of handling operations from time of receipt of materials to shipment of finished product. These charts also show that positioning operations exceed those of transportation and tiering and should receive adequate attention. Lyon-Raymond Corp.

**112** Crane Blocks—Catalog 200-16 provides specifications, dimensional data and prices on company's crane blocks designed for maximum headroom and available in 10 to 30 t capacities. Tells advantages of their shorter length. Also includes illustration, sizes and description of a standard heavy-duty crane block. American Hoist and Derrick Co.

**113** Expandable Conveyor—The extreme flexibility of both construction and applications of company's "accordion" gravity conveyor unit are emphasized in this 6-pp broadside. Filled with pictures of this portable conveyor expanded, contracted, curved and straight, and sketches showing ways it can be utilized with other conveying equipment. Many photos of installations. Ford Machinery Corp.

**114** Vibrating Conveyor—Bulletin 220 announces a mechanical vibrating conveyor which operates on a system of balanced forces and is adaptable for handling a wide range of materials. Text explains operation and advantages of the conveyor, illustrated with photos of open deck type and conveyor drive. The Jeffrey Mfg. Co.

**115** Fork Lift Trucks—Illustrated Bulletin 1403, 4 pp, gives general data on company's fork lift trucks in 1000-lb and 3000-lb capacities, explaining their operation, construction, and special features. Includes photos of both models in action. The Buda Co.

**116** Grooved Casters—Eight-pp Form CW-49 gives information on "V"-grooved wheel casters designed to operate on angle iron tracks. Eight photos show these casters in use by different industries. There are also cross sectional designs illustrating corner turns, turn-and-cross-over, and single and double switch installations of the track, suggesting the ease with which angle iron track may be installed, removed and relocated. The Bassick Co.

## PUMPS

**117** Industrial Pumps—Turbine-type and centrifugal pumps to meet practically all pumping needs are covered in this 12-pp catalog. Illustrated with photos and engineering drawings, it contains data on design features, construction specifications and applications; also includes condensed

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selection information and references to company's descriptive literature covering each type of pump. Aurora Pump Co.

**118** Rotary Pumps—Catalog LO, 4 pp. provides cutaway drawings and descriptions of six different types of company's "IMO" rotary pumps, designed to handle residual and distillate fuel oils, crude oils, lubricating oils, viscous fluids and similar liquids. Discusses reliability, high speeds, freedom from pulsation, accessibility and other advantages of these pumps in capacities ranging from 0.5 to 1000 gpm for pressures to 300 psi and to 1000 gpm for pressures to 1500 psi. DeLaval Steam Turbine Co.

**119** Centrifugal Pump Manual—Bulletin 812-A, 12 pp, is a revised instruction booklet on the installation and operation of centrifugal pumps in corrosive service. While dealing specifically with manufacturer's pumps, the information is applicable to all centrifugal pumps. It covers location and foundations for pumps, correct alignment, priming, piping arrangements, adjustment of impellers, and how to overcome common troubles. Friction data, formulas for figuring capacity, head and horsepower, and conversion data are included, as are many photos and drawings. Intended for frequent reference, this book is printed on varnished and "smudge-proof" paper. The Duriron Co., Inc.

**120** Vertical Turbine Pumps—Oil lubricated and water lubricated turbine pumps are described and their column assemblies illustrated by large sectional drawings, in color, in 8-pp Bulletin P1-178A. Stresses adaptability afforded by optional driving and construction arrangements. Bulletin also discusses and illustrates company's research and engineering facilities. A. O. Smith Corp.

**121** Centrifugal Pumps—Four-pp Bulletin 346 introduces company's two-stage volute centrifugal pumps, giving complete specifications and engineering data. Pump's design and construction are shown by means of a large cutaway drawing. Includes dimensions, rating table. Warren Steam Pump Co.

**122** Pump Selection Guide—This booklet provides photos and brief descriptive data on company's turbine type and centrifugal pumps for a wide range of applications, telling the special features and capacities of each and referring to company's technical literature covering each class of pumps. Aurora Pump Co.

**123** Sump Pump—Circular 19, 8 pp, describes important features of company's automatic submersible floatless sump pump. Operation of the floatless liquid level switch that actuates and controls the pump is also described and illustrated. Other helpful information includes capacities for various discharge head requirements, weights, dimensions, voltages, prices and basic construction details of the entire assembly. Kenco, Inc.

**124** Centrifugal Pumps—Bulletin 48, 16 pp, covers two types of vertical self-priming centrifugal pumps—a coupling connected unit with bearing bracket, and one with no bracket and the impeller mounted on an extended motor shaft. Sectional drawings are used to illustrate seal design and priming action and all parts of both pump assemblies. Also presented in this informative booklet are instructions on installation and care of the pumps and pointers on operating them. The LaBour Co., Inc.

## AIR CONDITIONING

**125** Conditioning Units—The advantages of company's self-contained conditioning units and their applications in cooling, dehumidifying and cleaning are presented in illustrated Catalog 1307, 48 pp. Text explains their installation and operation. Complete engineering data is presented, covering direct expansion cooling, cold water cooling, hot water heating, steam heating. Also includes speed and horsepower tables, dimensional data on both horizontal and vertical types, performance chart and typical problems involving choice of unit size, number of rows of coils, determing speed and motor horsepower. Claude Pah Co.

**126** Cooling Towers Data—Section 42 covers induced draft cooling towers for small water-cooled air conditioning and refrigeration condensing units. Illustrates towers and pumps, and discusses applications, operation and installation of the towers, giving specifications. Includes a typical installation diagram, capacity and performance tables, also tower and pump selection table. Binks Mfg. Co.

## DUST AND FUME CONTROL

**127** Dust Control—The operation, construction, versatility and maintenance of company's new unit dust collectors are explained in this excellent illustrated bulletin. Includes table of capacities and sizes, also photos of several sizes of the units. The Kirk and Blum Mfg. Co.

**128** Dust Collectors in Industry—Bulletin 342, 4 pp, is an industry report on the use of company's dust collectors particularly in the manufacture of rubber goods. It takes up the problems of nuisance dust and the recovery of usable powdered materials, suggesting as a solution, hooded and piping arrangements to trap dust at the source. Photos and drawings illustrate the use of this equipment in obtaining better working conditions, more satisfied labor, closer quality control, recovery of usable material, and lower maintenance cost. American Wheelabrator and Equipment Co.

**129** Welding Fume Collectors—Bulletin 27-D, 4 pp, describes and illustrates, in color, company's fume collecting equipment for welding operations. Discusses collectors' advantages including collecting fumes at the source, hood protection, adequate working range, strong construction and ease of installation. Illustrates regular, long-reach and special collectors, giving dimensions and application information. Also describes a ventilated welding cabinet. Beemsterlin Mfg. Co.

## VALVES, PIPING ACCESSORIES

**130** Reducing Valve Engineering Data—Bulletin 903 presents data on pressure reducing valves, explaining how the streamlined contour contributes to the efficiency of performance. Discusses and illustrates, by sectional drawings, valve's straight-line flow, wide opening, tight closing and other design features. Includes sizes, dimensional data and steam and air capacity charts. A. W. Cash Co.

**131** Strainers—Bulletin S-302, 4 pp, describes and illustrates company's fine screen strainers for steam traps, reducing valves and other pipe line equipment. Tells why strainers are needed; discusses special features and construction details of these strainers. Includes pressure and screen data tables, suggestions for installing, and dimensions, weights and prices. Yarnall-Waring Co.

**132** General Service Valves — Bulletin E-166, 16 pp, describes and illustrates the design and construction of company's quick-operating valves, explaining their application to blow-off service and on fire protection, chemical process, soot blower, water column blow-down, and other types of pipe lines. Included are tables of dimensions, weights and list prices for straight lever and rack-and-pinion types, inside packed and with outside stuffing box, and with screwed or flanged ends. Everlasting Valve Co.

**133** Ball Valves—Company's line of valves actuated by the venturi-ball principle are fully described in 16-pp Bulletin 142. This well illustrated catalog covers their principle of operation, and provides necessary engineering data, specifications and sizes on the line which includes "whistle," bar stock, cast steel and stainless steel and forged valves. Standard handwheel, quick opening lever, diaphragm and other valve types are described and their advantages given. Paul Valve Corp.

**134** Tank Flanges—This 4-pp bulletin explains and illustrates a flange which serves as a pipe connecting unit for either inside or outside of tank; also a flange cutter for making openings in tanks. Gives advantages, uses, specifications and sizes of the flange, explains operation of the cutter. American Pipe & Steel Corp.

**135** Liquid Shock Absorbers—This is a 2-pp bulletin featuring four models of a compact shock absorber for eliminating shock and hammering in pipe lines carrying water or petroleum products. Description, applications, installation instructions and list prices are included. B-D Products Corp.

## INSULATION

**136** Thermal Insulations—This 16-pp booklet covers briefly all forms of company's thermal insulations for industrial and building applications. Gives general information on the line, stressing non-combustibility, durability, corrosion resistance and other major advantages. Data on thermal conductivity and sound absorption properties are included. Illustrated with numerous application photos. Owens-Corning Fiberglas Corp.

**137** Insulation Economy—This 24-pp booklet on the control of industrial heat and power losses through insulation features a series of nine typical cases illustrating the economy of mineral wool and

(Continued on page 89)

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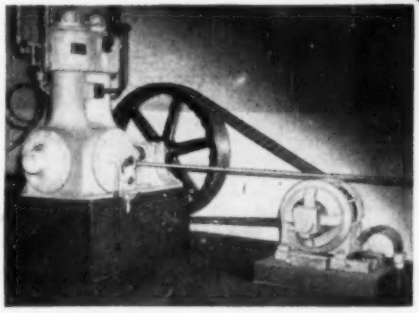

## How good can a Cog-Belt get?

An ice cream manufacturer recently phoned his local Dayton Distributor about replacement of one Dayton Cog-Belt on a multiple ammonia compressor drive. Maintenance records showed that all the Dayton Cog-Belts had been on since 1930—nineteen years before the first replacement.

## Dayton Cog-Belts

### deliver 40% more H. P. per belt, save space, cut costs

Dayton Cog-Belts operate on ordinary pulleys on any V-Belt drive, yet transmit 40% more horsepower per belt. Why?

Cog-Belts are the only V-Belts scientifically "built to bend". As the belt goes round the pulley, preformed cogs close up (like the joints of your finger) to take up compression. Strain and distortion are eliminated, flexing heat minimized, no inching or bumping around the pulley. 40% more efficient, Dayton Cog-Belts allow use of 25% narrower pulleys, equivalently shorter centers, smaller total drive area.

If you are having belt troubles—want to save drive space, simplify maintenance, convert easily from flat to V-flat—or, if you just want a better V-Belt, call your Dayton Distributor.

*T. M.

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Dayton Rubber

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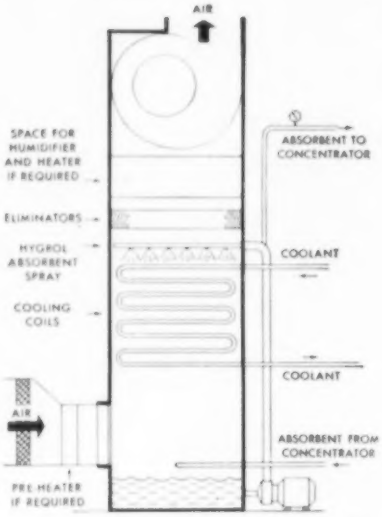
# New Method Gives Precise Control in Air Conditioning

**Niagara "Controlled Humidity Method" Uses Hygrol, Hygienic Liquid Absorbent**

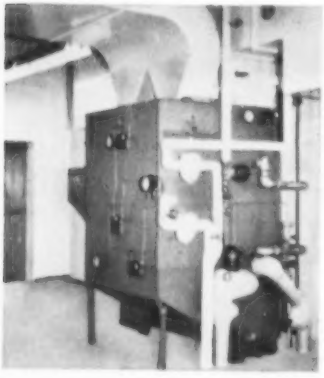


NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

● The Niagara "Controlled Humidity Method" is a new system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required. A condition of 15 grains of moisture per pound of air at 85 deg. F. dry bulb temperature has been produced without refrigeration.

The apparatus is enclosed in a casing thru which the air is drawn by fans. The air is filtered and then enters a chamber where it is dehumidified in passing thru a spray of "Hygrol" Liquid (a hygienic hygroscopic chemical that absorbs the air-borne moisture and contains no salts or solids to precipitate). In the same chamber are located cooling coils which remove the latent heat of evaporation and also sensible heat as required.

The absorbent liquid spray falls into a tank at the base, where it is piped to a concentrator, removing moisture taken from the air. The re-concentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.



The same equipment may be used to provide winter air conditioning when required, by installing a tempering coil at the outdoor intake, an humidifier, and a reheat coil above the eliminators.

This equipment is manufactured in a range of sizes providing from 1000 to 20,000 CFM of conditioned air from a single unit, and mutiple unit installations are practical. It is expected that, by reducing the need for refrigeration, the cost of air conditioning will be reduced by this method. Applications generally are in a temperature range from 35 deg. F. upward. Below the freezing temperature of water, the Niagara "No-Frost" method is applicable.

The equipment is protected by U. S. and foreign patents. Installations have been made in food and chemical process industries, in packaging hygroscopic products, for preventing condensation of moisture on metals and other products in storage, in air conditioning for laboratory control and for human comfort.

For further information, write Niagara Blower Company, Dept. PE, 405 Lexington Ave., New York 17, N. Y.

*(Continued from page 24)*

The Mechanical Building will have an area 160 ft long and 75 ft wide with a 30 ft ceiling. A 50-foot wide floor area along one side, extending the length of the building, will be covered by an overhead crane for erecting and servicing special set-ups, new designs or new investigations of most any nature.

Two wings, 275 ft long and 70 ft wide will contain 36 test cells. Under all the test cells there will be a full basement for servicing the work floor above. Utilities will be in the open, distributed on a large loop which hangs at a convenient height from the basement ceiling.

The Process Building, to occupy slightly over three acres, will house a large modern machine shop, heat treat department, electro-plating lab, garage and cold room facilities.

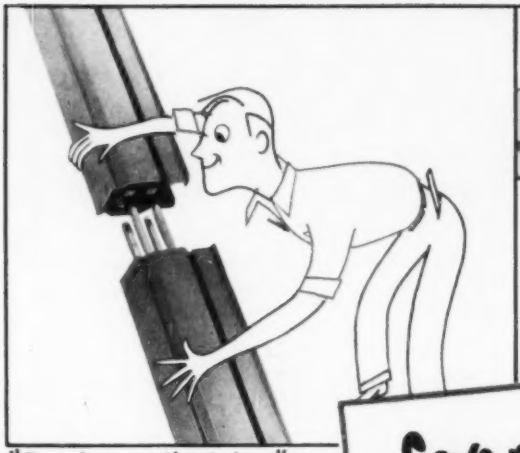
The Kettering Laboratories will be of special design, 670 ft long and 55 ft wide. Here will be located the chemical departments; organic, inorganic, electro, and industrial hygiene; the electrical research departments involved with ignition and electronics; instrumentation and physics; the offices for our mechanical departments; our drafting rooms and special laboratories.

Offices and laboratories will be situated on each side of long corridors. The "thick" corridor walls will contain pipe shafts in which the utilities will be located. Gas, compressed air, vacuum, water, electricity, and ventilation ducts will be all contained in these corridor walls and readily available for laboratory work. Other sections of these walls will be used for coat closets, fire extinguishers, file space, etc. *From an article by Fred Huddle, Head, Plant Engineering Department, in Lab Notes, a publication of the Research Laboratories Division of General Motors Corporation, Detroit.*

## Pure Direct Current For Electrolytic Work

RECENT DEVELOPMENTS in electrolytic processes throughout industry have created a need for tremendous quantities of low-voltage, high-current d-c power. The Homopolar Generator, designed to supply direct current, may offer a practical and economical means of producing tens . . . even hundreds of thousands of amperes at a few volts. Recent inquiries from the electrolytic industry have indicated the need of equipment capable of supplying low-voltage d-c power in quantities of 50,000, 100,000 and 1,000,000 amperes from a single source.

Our company is now presenting to industry the first practical Homopolar Generator . . . one capable of delivering 21,000 amp at 18.7 v. It is important to note that very little change in the Homopolar Generator size and design would enable this machine to deliver 100,000 or more amperes at low voltage . . . suitable for electrolytic processes such as electrotinning, electroplating, electrogalvanizing and so on. The size of a Homopolar Generator is proportional more to the voltage developed than to its current capacity. *From a release by The Electric Products Corp., 1725 Clarkstone Rd., Cleveland 12, Ohio.*



# Save money these 3 ways when distributing power

## "Quick-install-ability"

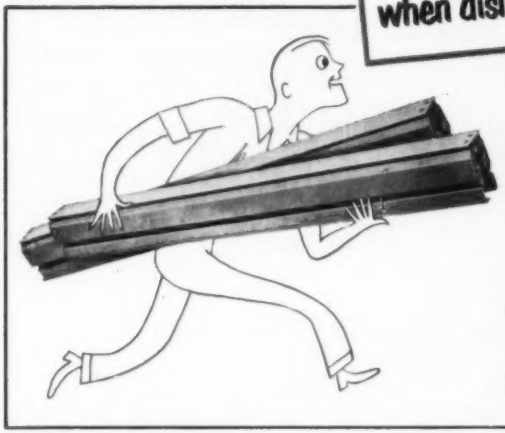
**saves initial cost**

LTG FLEX-A-POWER busways are pre-fabricated housings which are easily coupled in any arrangement and in runs of any required length. Time for installing is much less than for wiring and conduit.

## "Plug-in-ability"

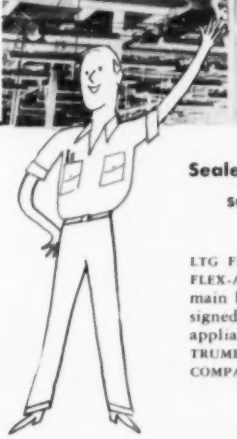
**saves time relocating machines**

Take-off plugs or trolley can be inserted anywhere (no drop-out section needed for trolley). You can add or relocate loads without rewiring expense and without long extensions.



## "Take-apart-ability" saves material expense

Whenever a *major* relocation of outlets is required, the entire FLEX-A-POWER system can be dismantled, removed to another location and re-installed with practically 100% re-use of materials.



**Sealed Power Corp.**

**saves with Flex-a-Power**

LTG FLEX-A-POWER, one of six forms of FLEX-A-POWER for various services from main breakers to individual loads, is designed for light-duty lighting, small tools, appliances. Write for Bulletin TEC-3, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

**TRUMBULL (T) ELECTRIC**

# NO "FREEZE-UP" with YARWAY TRAPS

Yarway Traps beat the worst weather in this installation at Thermoid's Trenton plant.

**Troubled with outdoor steam traps freezing? Solve the problem the way Thermoid did at their Trenton, N. J., plant.**

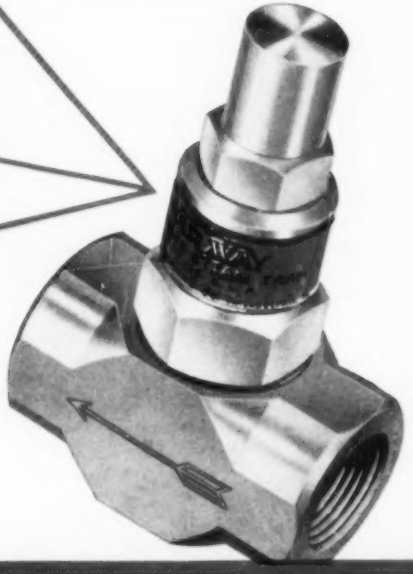
They installed Yarway Impulse Steam Traps on coal handling equipment. Now, though temperatures dip to zero and snows pile high, their traps never freeze.

Condensate does not accumulate in Yarway Impulse Traps. The only moving part—a little valve—floats on the load. It discharges condensate as it comes through, instead of waiting for a quantity to accumulate. Hence—nothing to freeze.

Add to that, Yarway Traps' reputation for low maintenance, quick heating, easy installation, and economy of operation and you have reasons why over 600,000 Yarways have already been bought.

Often it costs less to install new Yarways than to repair old type traps. See your nearest Mill Supply Dealer. For his name, and free Yarway Trap Book, write . . .

**YARNALL-WARING COMPANY**
**145 Mermaid Avenue, Philadelphia 18, Pa.**
*Branch Offices in Principal Cities*



**YARWAY IMPULSE STEAM TRAP**

# *Safety Crimes* —Not Here

**Buffalo Division of Twin Coach Co. engineered safety in its plant by equipment and layout improvements . . . Included are those relating to machining, metal cleaning, grinding, buffing, polishing, case hardening and welding . . . Examples not shown are: Speeded-up lacquer drying to reduce workers' exposure to heat and fumes to a minimum . . . Exhaust system to permit assembly line testing of all bus motors**

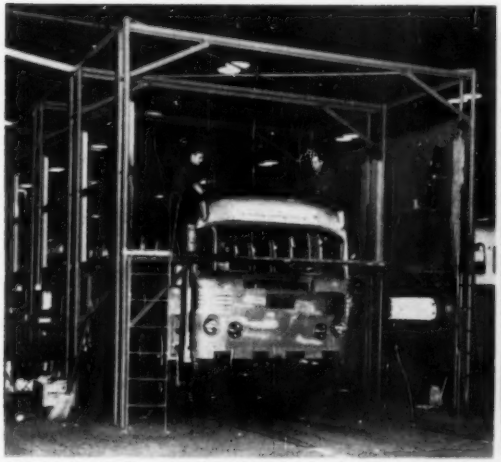


**Fig. 1. A significant undertaking in the behalf of workers' welfare is this $3,000 platform for bus cleaning. This platform has largely done away with the risk of falling. Note extinguisher at right. As usual, the safety device has paid off with faster, more efficient work**

**Fig. 2. The installation of two spray booths like this one has added to safety factors. These are completely enclosed, provide improved ventilating systems. The "waterfall" air washer at the left absorbs spray fumes and paint particles from the air. Explosion-proof lighting helps, too**

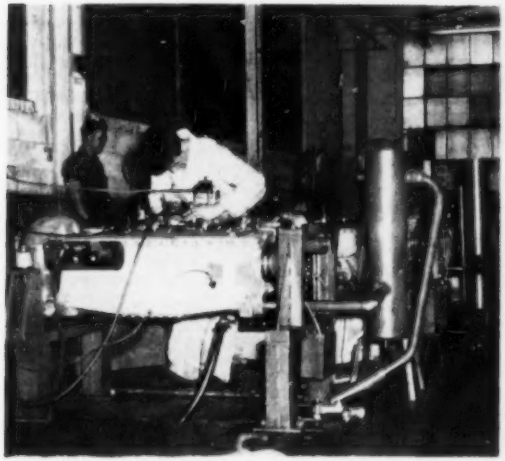


**Fig. 3. The plant engineering department constructed four motor test stands out of welded steel brackets and channel iron. The drain area under each motor simplifies discharge of oil and water from individual motors and keeps workers safe from accidents caused by unsure footing**

**Fig. 4. Twin Coach has instituted the use of balances, A-frames, overhead lifts, mechanical chain balances and overhead cranes along all assembly and sub-assembly lines. Worker at the right is using a chain-balanced, 85 lb riveting machine and is able to work all day without fatigue**

# Stop Freeze-ups—Pamper Your Sprinkler Tank Heating Equipment

**Solid water in the form of ice makes poor fire protection . . . Two most common types of tank heating systems are discussed along with primary points to be considered in their maintenance and operation . . . Circulating heater type and radiator heater type . . . Keeping the tank itself in good condition . . . Insufficient heat and excessive pounding**

By H. A. SWEET, Engineer, Associated Factory Mutual Fire Insurance Companies

FREEZE-UP OF a sprinkler tank usually means expensive repairs. It always means impaired fire protection. A modern, approved tank heating system correctly installed and properly maintained will safeguard your sprinkler tanks through the winter.

Because proper care must begin with a before-hand knowledge of troubles that can develop, here are trouble-shooting suggestions covering the two most common tank heating systems . . . the circulating heater type and the radiator heater type.

Fig. 1. This can happen. The water froze at the surface, producing an air-tight seal. When water was withdrawn from the tank the resulting vacuum under the ice buckled the steel sides

**Circulating Heater System**—In the circulating heater system, cold water flows down the main discharge pipe of the tank and through the heater. The heated water rises through a small independent pipe and is discharged into the tank. The hot water pipe is usually enclosed with the riser in a frostproof covering, but sometimes is placed inside the large risers which have no frostproof casing. Fig. 2 is a typical circulating heater with frostproof casing.

Valves A, B, and C in the water circulating pipes are kept wide open throughout the heating season. The thermometer is located where it will show the temperature of the coldest water and this should be maintained at between 42 F and 50 F by regulating the heater. Make thermometer readings daily. Temperatures of 40 F or lower indicate insufficient heating. When the steam supply to the heater is shut off because the tank water is heated sufficiently, circulation ceases soon and the water in the circulating pipes near the heater gradually assumes the temperature of the surrounding air. Under these conditions it is necessary to turn on the steam and establish circulation to obtain a correct reading of the temperature of the water in the tank.

**Radiator Heater System**—The radiator heating system is used only in large steel-plate risers. Briefly this consists of a vertical pipe or radiator, capped at the top. Inside of this is a smaller pipe, open at the top, which supplies steam. Fig. 3 shows how this radiator would heat the water in the riser. The dotted lines show a pipe sleeve that is frequently used to facilitate the upward movement of heated water into the tank.

The thermometer is located in the "cool water" area of the riser. Thermometer readings should be made daily during the heating season, and the temperature maintained high enough to prevent ice forming in the riser or on the surface of the water. If the radiator has a sleeve, the temperature of the water at the thermometer should be maintained at 42 F or slightly above.

In older equipment where there is no sleeve around the radiator, determine the difference in temperature between the coldest water at the tank surface and the water in the riser, and then keep the riser temperature high enough to keep the water surface temperature from dropping below 42 F. There are two ways of obtaining the surface temperature: (a) send someone up the tank after the system has been in operation a few days in cold weather, or (b) install a long distance thermometer bulb through the tank shell about 3 ft below the top and have the indicating dial in a weatherproof cabinet near the base of a tower column. You can, however, install a temperature controller bulb through the side of the tank about 3 ft below the permanent water level to give an alarm when the water temperature drops to 42 F.

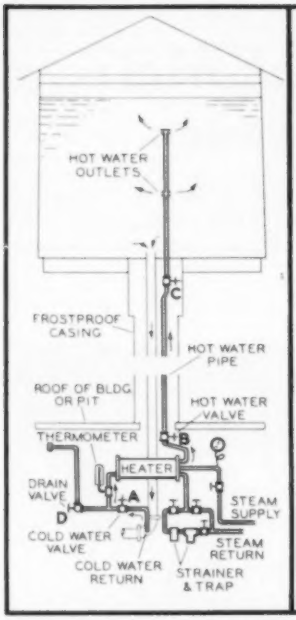
## General Maintenance

Before the heating season begins, check the accuracy of thermometers and pressure gages, as well as adjustments of relief valves, steam regulators, pressure-reducing valves, thermostats, and safety pilots.

Sediment or scale may have accumulated which will reduce the efficiency of the system. Either heating equipment or tank may have developed defects since the last heating season. If the heating system wasn't completely cleaned out last spring, give it a thorough cleaning now, and repair or replace equipment where necessary. Replace badly corroded heater pipes with copper water tubing, brass (85 per cent copper) or genuine wrought iron.

**Circulating Type System** — Each spring, clean the trap, strainer, and accessories. Wire-brush the steel or iron heating surfaces of coal, fuel oil, or gas-fired heaters.

Rust and sediment can be removed by flushing the circulating pipes and heater each fall and occasionally during the heating season. This is done by closing the cold water valve A (Fig. 2), opening the heater drain valve D, and letting the water run from the hot water pipe until it



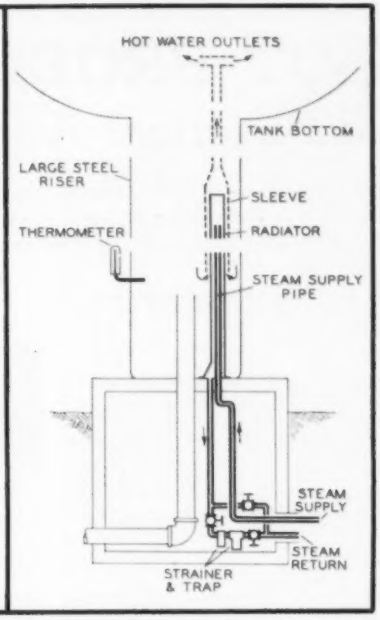




**Fig. 2. Left: Circulating heater system with a frost-proof casing. Fig. 3. Right: Radiator type heating system is used only in large steel-plate risers**

comes clear. Then close valve B, open valve A and flush the cold water pipe and riser until the water is clear. It should be pointed out that flushing directly from a small connection at the bottom of the heater shell does not give sufficient flow to remove sediment, and scale effectively. After flushing make sure that valves A, B, and C are wide open, the drain valve D is closed tight, and the tank filled. If the tank is filled by overflowing, take care not to let ice form on the tank or tower.

After the system has been in service a day or two, feel the hot water pipe with one hand and the cold water pipe with the other. An appreciable difference in temperature indicates good circulation. Temperatures of 40 F or lower indicate insufficient heating. Unusually high temperatures in the cold water pipe near the heater indicate that the water is not circulating properly because the heating pipe is clogged by ice or other obstruction.

**Radiator Type System** — Each spring, clean out and overhaul traps, strainers, and other accessories. Wire-brush the steel or iron heating surfaces of coal, fuel oil, or gas-fired heaters. Oil automatic accessories as needed. Every five or six years, when repainting the tank, take the radiator heater apart and clean out all pipes.

You can help the heating equipment by keeping the tank roof in good weathertight condition and keeping the hatch cover securely closed. Avoid excessive overflowing of the tank when freezing weather threatens.

If a leaking wooden tank can't be repaired, it should be replaced. When a leak in the top foot or so of a wooden tank can't be stopped, you can lower the inlet of the overflow pipe just enough to stop leakage, provided the remainder of the tank is watertight. Repair or replace any deteriorated frost-proof casing around the riser or at the bottom of the tank.

And while we're on the subject of insulation, take warning that you are taking a chance if you rely on insulation alone to protect a tank discharge pipe running through unheated rooms. A steam pipe is needed for heating purposes inside the insulation.

**Causes of Insufficient Heat**—Maintain the steam pressure. Insufficient heat will stop gravity water circulation and pipes will freeze quickly in extreme weather. If steam is low because boiler fires are banked at night or during week-ends, or is intermittent because the boiler is controlled thermostatically by room temperature, your sprinkler tank should have the protection of a separate boiler. Either that or provide forced circulation arranged to start automatically when steam pressure drops too low in extreme weather. In this case, maintain the temperature of the tank water higher than if steam was constantly available.

The supply of heat may be inadequate because a larger heater is needed, or because the main boiler is too small to meet the demands of both the tank and the plant.

Tank heating troubles may be in the pipes. Perhaps one of the several valves is closed, or partly closed, when it should be wide open, a condition simple enough to correct. But it may be that the capacity of the steam pipe is too small or that the hot water pipes don't pitch upward toward the tank at all points. If the pipes can't be pitched properly and all pockets removed so that water will freely circulate by convection currents, forced circulation should be employed.

Pipe connections at the heaters are sometimes found to be in reverse. Check to make sure that the hot water is connected to the high-point of the heater shell, and that steam is connected to upper end of the heater coil.

Occasionally, too, a hot water pipe is found to be connected directly to the 6, 8, or 10-in. tank discharge pipe. For satisfactory circulation, the hot water pipe should extend independently into the tank. The hot water outlets should be located at 1/3 and 2/3 the depth of the tank. If an outlet is too near a lowered surface or too near the bottom of the tank, circulation is impeded. Should ice form on the surface of the tank even though circulation appears to be normal, it's probably because the heating element is too small or the hot water pipe is corroded through at a point near the bottom of the tank and circulation is only in the lower part of the tank.

Excessive pounding in the steam supply pipes has several causes. One is condensate collected in a pocket. This can be corrected by pitching the pipe to eliminate the pocket or by draining the low point with a trap. When the steam pipe is connected directly to a 6, 8, or 10-in. tank discharge pipe, water hammer may be strong enough to break the pipe. The best remedy is to install a circulating heater. Excessive pounding results also when the heater is in the vertical position when it should be horizontal or vice versa. Under these conditions heat delivered will be much less than the estimated capacity.

Excessive pounding may mean that circulation has been in the wrong direction and is now righting itself. If no trouble has occurred previously and the hot water valve is wide open, the disruption of the circulation was most likely caused by an obstruction in the hot water pipe. The pipe should be cleaned out or replaced. Where a heater is located away from the tank drop pipe so that cold and hot water piping is excessively long and without good slope, circulation may develop in the wrong direction when steam is first turned into the heater. To avoid this or to remedy it, the cold water valve should be throttled until circulation has started properly.

# PARKING LOT PROBLEMS?
## Here Are Some Practical Answers

**Determining size of lot . . . Various types of surfacing . . . Protection of cars from theft or vandalism . . . Guards and parking supervision . . . The most troublesome problem of all for some—snow removal**

By W. H. FISCHER, Plant Engineer, The Underwood Corporation

EVERY plant engineer has struggled with the problems of building, maintaining, protecting and supervising employees' parking lots—a simple operation that involves many headaches. Much of this grief can be avoided by the judicious use of care and foresight, levened with common sense and experience.

**How Big?** The first important point is a reasonably accurate estimate of the size of the parking lot required. This depends upon the number of employees and how many drive to work, or more specifically considering doubling up, how many cars are driven to work. If this is not already known, it can be readily determined by a poll of employees. If two or more shifts are working, it must be kept in mind that one shift arrives before the preceding one leaves, so that allowance must be made for this fact.

How much space per car will be required? In our plant a 3.5-a. lot holds 775 cars, or about 220 cars per acre. Last winter, however, heavy snow at times reduced the capacity to 600 cars so that a figure of about 200 cars per acre is probably reasonably safe for average conditions.

**Surfacing Is Important.** Once the size of the lot has been decided, and a suitable site selected, surfacing is of major importance. Our 3.5-a. lot was formerly the site of a large foundry. After the foundry buildings were razed, the ground was leveled with a bulldozer and the entire lot surfaced. Steam ashes and rock dust were spread, then oiled with a mixture of throw-away material consisting principally of cutting oils mixed with scrap japan. One gallon of roofing compound was added to each ten gallons and the whole mixed thoroughly in an open tank. It was spread on the surface from 5-gal. sprinkling cans fitted with wide flat nozzles. The mixture was allowed to soak in and then covered with a sprinkling of sand spread by hand shovels. The surfacing cost was less than $0.10 per sq yd and most of this cost was for labor.

Many surfacing methods are available however, the choice depending largely upon the nature of the soil, materials available, and the permissible cost. When the lot is within the plant grounds a good method is to level and pack with a bulldozer, then lay 5 to 6 in. of traprock with a top dressing of stone dust, properly graded to give good surface drainage. If possible, this drainage should run to catch basins, from where it can be piped to storm sewers or culverts. We have found that this surface, treated with one coat of road oil each year, gives excellent results, both in hot and cold weather and when snow removal is involved. Calcium chloride surfacing requires a high silica sand aggregate for bonding. On the other hand, two of the cheapest high-bonding aggregates, steam ashes and rock dust, spread and pack with the least amount of equipment. This is a distinct advantage to all but the largest plants.

**Protection Is A Must.** One of the cleverest gangs of automobile thieves yet caught took cars exclusively from plant parking lots, which were left unattended, within city limits proper. The reason is obvious, by starting soon after a shift change, the probability of an owner returning before 8 hr was slight. This incident emphasizes the necessity for theft-proof protection of the lot, particularly where located outside the area of good police protection. It is essential to keep out juvenile hoodlums who delight especially in smashing tail-lights and lenses.

Where a plant is located in the city limits, "built-in" security, afforded by a high industrial link type fence topped with barbed wire, is a must.

Photo, Caterpillar Tractor Co.

**Fig. 2. This snow shovel blade mounted on the same power unit that cuts grass in the summer is handy for small lots**

Floodlighting is equally desirable in all cases and essential where a night shift is involved. Next comes registration of cars. All cars should be registered on 3 by 5 in. index cards, with complete information: make, model, year, body type, color, and motor serial number. The card should show the owner's name, address, phone number and department in which employed. We have found such registration invaluable, for quick identification of owner, where lights are left on, or motor running, radio left on, and doors locked.

**Supervised Parking Necessary.** Parking should definitely be under the direction of guards. During shift changes, one guard per 200 cars is

Photo, The Carboloy Co., Inc.

**Fig. 1. A small tractor with a bulldozer is excellent for quick clearance of snow and is useful for other jobs around almost any plant**

usually sufficient on enclosed lots but on open lots it is advisable to have one guard per 100 cars. During working hours at least one guard should always be on duty.

We use 3 to 5 guards to park cars mornings, one guard all day, 3 at noon and 3 at quitting time to get the cars safely out of the lot. In good weather we can clear the lot in 12 min. while in stormy weather it may take 30 min. The lot is in the center of the city, with highly concentrated traffic lanes abutting two sides. We insist on one-way traffic, which experience has proven to be the fastest method of getting the cars out, and the best method for control of cars to be placed coming in.

For orderly parking of cars space markers are highly desirable although not absolutely necessary. Guard supervision is a real necessity however, otherwise cars will be parked at random. If this is permitted, no lot would be large enough to accommodate all and the danger of minor accidents and crumpled fenders is increased. This brings up another essential precaution. Conspicuous signs should announce that the company assumes no responsibility for the safety of cars or contents and that owners assume all risk of damage while cars are on the lot. All cars permitted to use parking lots, should have easily identified stickers on windshield, so guards can pick out unauthorized cars.

**Guards as "Traffic Cops."** We are completing installation of traffic violation books, so guards can put tickets on cars whose owners wilfully violate parking rules, or who park in restricted places in parking lot. These tickets will call for a visit to personnel manager's office for conference and instructions. A second offense is not for conference, but to advise that continuance of offense will mean discharge. Our records show no employee goes beyond conference stage, which we consider good performance and operation.

**Dat Ol' Debbil—Snow!** Plants located in the heavy snow belt find snow removal the most vexing problem of all. A heavy downfall presents a big job to be done in a very short time, if extreme confusion and high absenteeism are to be avoided.

Our snow problems are handled by using as a plow, a large dump truck with a 10-ft snow blade. We start plowing at 3 am while the lot is empty, pushing most of the snow to the fences and piling the rest in several large heaps in the center. These heaps are removed by hand shovel and dump truck. The past winter was very severe, and convinced us that a loader machine would be of decided value in quickly clearing heaps which took much space from December to April. As mentioned earlier, the capacity of the lot was reduced from 775 cars to 600 at times due to snow piles 20 ft wide and 8 to 10 ft high.

While the problems of parking lots are many and the expense can be considerable, in this age they are a necessary accommodation to employees and an important factor in worker morale, in the same class as good washrooms and cafeterias. The plant engineer who takes this philosophical view and plans the job carefully, can reduce to a minimum the time he has to spend worrying about this indispensable facility.

Another problem we had to correct—Our buildings are north and south in relation to parking lot. We originally started parking our cars north and south. We very soon received so many complaints from employees in our buildings facing the parking lots of intense sun glare reflecting from windshields and rear windows that we had to rearrange rows of cars and aisles so that cars are east and west.

Cars are arranged for various purposes—Those working 7:00 to 4:00, those working 8:00 to 5:00, office help 8:30 to 5:00, and 2 lines for employees who have business trips to make during usual working hours, one row of 20 cars is reserved in front of main aisle for visitors.

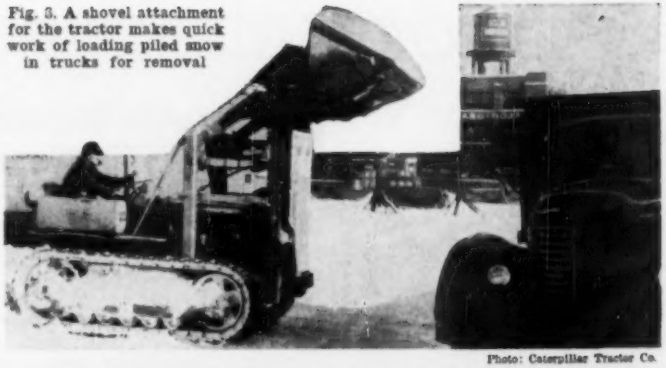


**Fig. 3. A shovel attachment for the tractor makes quick work of loading piled snow in trucks for removal**

Photo: Caterpillar Tractor Co.

Photo: Union Metal Mfg. Co.

**Fig. 4. Left: Floodlighting the parking lot makes night parking quicker and safer, and also provides necessary after-dark protection of cars as well**

Photo: Cyclone Fence, Div.

**Fig. 5. A fence like this says "Keep Out!" in positive terms to vandals and prowling thieves**

By R. W. DOERING,
Lamp Division,
Westinghouse Elec. Corp.

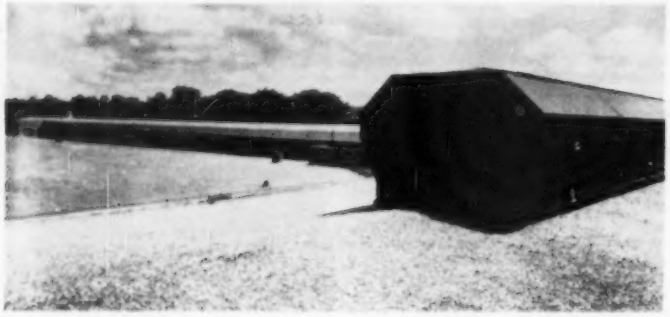


Fig. 2. Ventilator extends full length of roof over the area to be ventilated and permits hot air to escape freely against a wind blowing from any direction

# Good Ventilation Simplifies Lamp Production Problems

CERTAIN steps in the manufacture of lamp bulbs require carefully controlled ventilation to maintain the conditions necessary for production.

Automatic machines used in assembling the component parts into finished lamp bulbs contain batteries of gas flames, through which the glass parts pass successively until heated to the proper temperature for sealing. In this process, a great amount of heat is generated and must be conducted away from the machines and operators.

Extreme care must be exercised to prevent the creation of drafts in the regions around the machines, and therefore normal artificial ventilation such as produced by power roof ventilators is not satisfactory. Any drafts present would distort the gas flames and cause bubbles and irregularities in the glass.

The problem, then, is to remove the heat in the vicinity of the machines, and at the same time insure against the presence of excessive drafts. The recently constructed Lamp Division plants of the Westinghouse Electric Corp. at Little Rock, Ark. and Richmond, Ky., utilize the Swartwout-Dexter heat valve as a solution to this specialized ventilation problem.

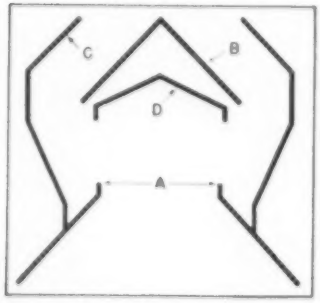



Fig. 1. Cross-section of heat valve used, showing: A, throat; B, ridge piece; C, baffles; D, damper

The Heat Valve is a form of continuous gravity ventilator that, simply speaking, opens the roof and allows the heat to escape. A constant, even flow of air enters the building, and upon being warmed rises directly upward so that the dead heat is released at the highest point in the building. No appreciable draft is created, and in effect the air flow short-circuits around the immediate area occupied by the machines.

Fabricated in 10-ft lengths, the ventilator units were easily installed, and no special considerations from the standpoint of building construction were necessary. Each unit has a base rating of 10,800 cfm, and the actual discharge at any time will of course depend on the temperature gradient between the floor line and the outside atmosphere. As the temperature difference increases, the discharge of the ventilator also increases.

Reference to the cross-sectional view of the ventilator in Fig. 1 indicates the four basic parts. The throat A is formed by the flashing plates which prevent outside air from entering to retard inside air flow or, in extreme cases, cause back draft. The ridge piece B is designed to cover the throat opening and exclude rain and snow and still permit the exhaust to flow around and into the outside atmosphere. Outside baffles C attached to the throat prevent the weather from entering the throat opening.

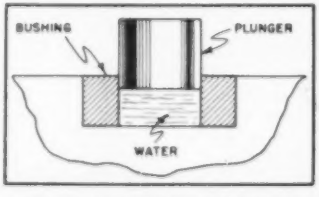
Their most important function, however, is to divert the outside wind current over the top of the ventilator and create a suctional lift regardless of wind direction. Weep holes in the bottom edge of the baffles provide drainage for water from the ridge piece. A snug-fitting, one-piece adjustable damper D moves in a vertical plane and closes tightly without heat loss.

The ventilator installation extends the entire length of the roof over the areas to be ventilated, giving better results than would be obtained with the spotty coverage and resultant air currents of individual power units.

## When You Hammer In, The Bushing Comes Out

SOMETIMES YOU are confronted with the problem of removing a bushing from a blind hole. Make a close-fitting plunger out of any material that is readily available and easily workable. Put some water, oil or other liquid in the opening. Then put the plunger in place and drive it into the opening with a hammer. The liquid will force its way under the bushing and push the bushing out of the hole.

The advantage of this method is that it removes the bushing without scratching the walls of the hole or damaging the bushing.




A moderately tight-fitting plunger will do the trick and push the bushing out

# GLASS FOR INSULATION—
## Easy to Cut, Acid Resistant, Versatile

**Plant Engineering**
*Product Application Feature*

**For hot and cold lines, indoors and outdoors, this product is described as unaffected by humidity, highly resistant to acid atmospheres, fumes and vapors . . . Non combustible and a fire-retardant and in addition is strong, rigid, light in weight and easy to cut and fit with ordinary tools . . . Suitable for temperature ranges from minus 200 F to plus 800 F**

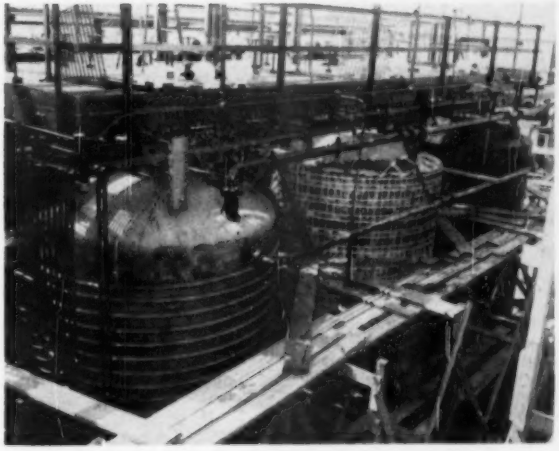


Fig. 1. **These three tanks show three different stages of construction of cellular glass insulation at Rohm & Haas' Deer Park plant. Insulation has not been started on tank to left; the center tank is shown with glass insulation and steel strapping in place while the third is complete with outside protective covering. Its imperviousness to water and vapor is an important quality**

CELLULAR GLASS insulation is reported to be achieving wide usage in many of the nation's industrial plants, especially chemical, petroleum processing and synthetic rubber. Composed of millions of tiny cells of inert air sealed in glass the insulation is said to be unaffected by humidity, to be highly resistant to fumes, vapors, acid atmospheres.

An outstanding quality is its fire resistance. The composition, furthermore, is strong, rigid, light in weight and easy to cut and fit without the use of special tools. The insulation comes in two equal half-sections, 18 in. long, and is being manufactured for all pipe sizes. Its temperature range is from minus 200 F to plus 800 F.

By virtue of its cellular construction this glass insulation has the same heat conductivity whether wet or dry and will maintain this, it is reported, without expensive weatherproofing or other protective coatings.

Readers who want further information on cellular glass insulation may obtain it by writing the Editor or just write "Glass Insulation" on the handy postcard elsewhere in the issue and drop it in the mail box.

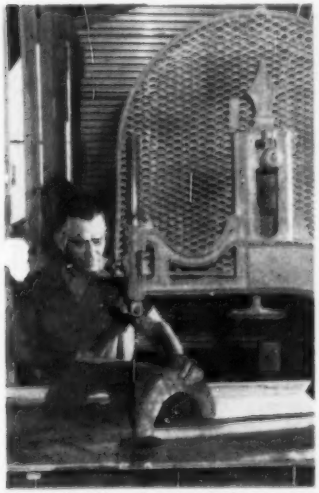


Fig. 2. **Cellular glass insulation is easy to cut and shape with ordinary tools. This shop forms odd shapes and sizes**

Fig. 3. **In order to seal all joints completely a mastic is applied to the open cells before the fitting is installed**

Fig. 4. **Fitting of the material is simple because of its light weight and the ease with which it may be trimmed**

# Simplified Plant Filing System Gives Complete Equipment Data

**One location for all data pertinent to any machine or piece of equipment is the prime purpose of an equipment file . . . Outline of data necessary . . . Instituting the file . . . Filed by alphabetical sequence or equipment number . . . Use for building repairs, other projects**

By **JOHN D. BREEDING**, Plant Engineer Designer, Curtiss-Wright Corp.

ANY PLANT ENGINEERING department will find most convenient an Equipment Filing System covering all pieces of equipment which require maintenance and servicing.

Such a system should contain separate folders, one for each piece of equipment of any size. A complete history of that particular piece of equipment will be available if a simple system, such as this article describes, is used. An ordinary 9½ by 11¾ in. manila folder will suffice for the separate files. On the inside fly of each folder will be stapled a mimeographed form with space provided for all necessary data.

The serial number is, of course, self-explanatory. The plant machine number is to be used only if such a system of numbering is used in the plant. The location is of importance because, if the machine is moved, a record of this movement may be recorded and thus the exact location of the machine, at all times, is known. The name of the machine is, again, self-explanatory. The purchase order number is of value in tracing a great deal of data. The cost is of value in amortizing the equipment. The remaining data is important as a check to determine whether or not sufficient information has been made available so the plant engineer can adequately erect, maintain, and service the machine.

If possible, the file should be started when purchase of the equipment is being considered. At this time any and all inquiries, replies and quotations should be grouped according to the companies quoting. When decision is made to buy, a copy of the purchase order is placed in the file along with the delivery date, specifications, plans for erection, servicing data, spare parts as recommended by the manufacturer, lubricating instructions, nameplate data, etc.

When the machine or equipment is delivered the serial number and plant machine number (if used) is entered in the file. The date of final inspection is also entered. From this point on, all pertinent data such as overhauls, relocation of equipment, changes in servicing, dimensions of parts, revamping, spare parts requisitions, etc. are all placed in the file. This procedure is carried on until the equipment has reached the end of its useful life at which time its final disposition is recorded.

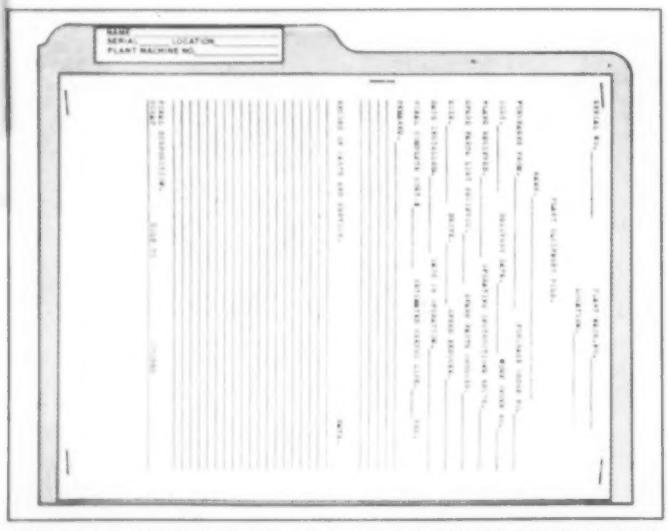
For the plant engineer who does not have a comparable system, such a file may be instituted without too much difficulty, even if the plant equipment is already in operation. In such a case the following list may be used as a guide in assembling necessary data. Most of the following can be secured from the manufacturer and from plant files. 1. Erection plans; 2. Spare parts list; 3. Lubricating instructions; 4. Operating and servicing instructions; 5. Supplier; 6. Date of purchase; 7. Date of first operation.

While some of these items may seem superfluous the author has found that all are important. Some of the data is seldom used but the time spent in compiling it is insignificant in proportion to its importance when it is needed in a hurry.

In the case of extensive building repairs or any other sizeable project in which no equipment is involved the author has found the file useful. For items such as roofs, floors, walls and other repairs the record is of value in tracing costs and recurrences and comparing values of various products.

The individual files are grouped together according to plant machine number or in alphabetical sequence. The latter is usually more convenient.

By the use of this system, the plant engineer will always have equipment case histories readily at hand. They provide information to accounting, top management and plant engineering. Users of the system will, of course, have to make minor variations to suit their individual requirements and specific needs.




**This record, stapled inside the back flap of a manila file folder, makes instantly available all data pertaining to any piece of equipment**

# Planned Electrical Modernization Will Lower Costs

**System balancing made easier, more exact with records . . . Determining when reduced demand factors are worthwhile . . . Metering may reveal low spots which lend themselves to profitable power factor correction . . . Sheer capacity in electrical distribution systems is not economical; true economy brought about by careful scheduling of loads . . . Excessive voltage drops, their reasons and remedies, discussed**

By **WILBUR J. FLEIG**, Consulting Engineer

MODERNIZATION and conversion programs for electrical distribution systems vary in detail as widely as the plants to which they apply. All of them, however, have certain similarities so that the basic line of approach and procedure can be followed over and over. An earlier article[1] discussed: the importance of load surveys; the desirability of planning for future needs; and the general method used to determine load center location. The original survey produced additional data essential to detailed planning, economical installation and intelligent scheduling of work.

Among the operations which this additional data made possible are the following: Balancing of single-phase loads on 4-wire, 3-phase feeders; reducing demand factors for 3-phase feeders; power factor correction for induction motor loads; load scheduling; determination of system voltage levels and operational status of mechanical systems; detailing layout plans; and development of a maintenance record system for equipment and loads.

In the beginning, the conversion of this system from dc to ac permitted the use of existing 3-wire, 120-240 v d-c lighting panels. An effort was made to distribute the loads between the phases but eventually lighting changes and additions disturbed this original balance. When these unbalanced conditions brought about significant differences in phase voltages, or reduced reserve 3-phase feeder capacity by more than 400 kva, the situation was rectified.

This procedure involved setting up a record system to cover every lighting feeder and lighting panel. Uniform tracings were made for each of the 53 feeders and 350 panels. Tracings for the panels are 8½ by 11 in. Loose-leaf books of blueprints, Fig. 1, have been made and issued to all management and maintenance personnel concerned.

Tracings for the feeders are 24 by 32 in. They show the proper phase connections of all panels connected to each of three feeders, plus the maximum values of current as determined by graphic recording. These large blueprints receive the same distribution as the smaller prints and are also placed in corresponding main switchboard rooms. With this information compiled, the task of balancing the system was much simpler than it would have been by trial and error.

Equally important, reference to these records shows immediately the data which must be taken into account in planning circuit or loading alterations or additions. Figure 2 is reproduced from three phases of one lighting feeder showing load unbalance, magnitude and character of loading and load scheduling.

Design or layout, of necessity, must be based upon demand factors which have been established by past experience for similar types of loads. These factors may be obtained from the National Electrical Code.[2] However, they do not include all types of loads, and cannot reasonably cover more than general conditions of operation. Conceivably, then, if demand factors could be sufficiently reduced in particular cases, the resulting savings in feeder installation costs would be worthwhile.

Power consumption records, made of various grouped motor loads, revealed that considerable benefit might be realized from reduced demand factors. The records showed that the escalators gave promise of possible savings in this respect. The total power consumption of the escalators did not vary in proportion to the amount of store traffic. An increase in load on "up" stairways was nearly compensated by the same increase in load on "down" stairways, with the latter having lower power consumption for greater loads. A

[1] Make Electrical Distribution Fit Your Specific Conditions, Page 34, November, 1949, PLANT ENGINEERING.

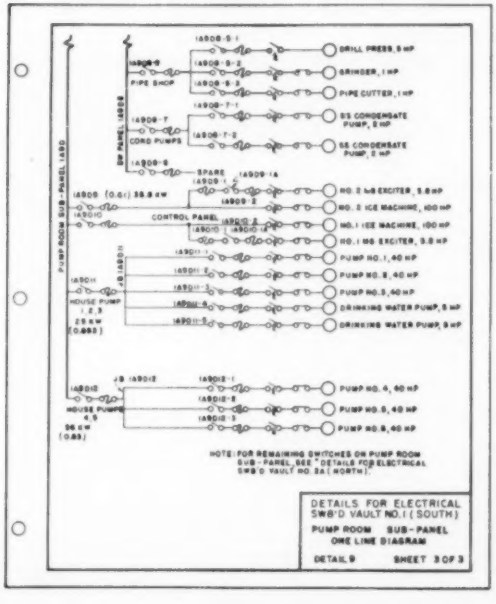

DRILL PRESS, 5 HP
GRINDER, 1 HP
PIPE CUTTER, 1 HP
SS CONDENSATE PUMP, 2 HP
SS CONDENSATE PUMP, 2 HP
SPARE
NO. 2 ICE MACHINE, 100 HP
NO. 1 ICE MACHINE, 100 HP
PUMP NO. 1, 40 HP
PUMP NO. 2, 40 HP
PUMP NO. 3, 40 HP
DRINKING WATER PUMP, 5 HP
DRINKING WATER PUMP, 5 HP
PUMP NO. 4, 60 HP
PUMP NO. 5, 40 HP
PUMP NO. 6, 40 HP
CONTROL PANEL
HOUSE PUMP 1, 2, 3
HOUSE PUMP 4, 5
DETAILS FOR ELECTRICAL SWB'D VAULT NO. 1 ( SOUTH )
PUMP ROOM SUB-PANEL ONE LINE DIAGRAM
DETAIL 9
SHEET 3 OF 3

**Fig. 1. Detailed one-line diagrams such as this have been made up in booklet form and distributed to maintenance and supervisory personnel**

[2] Available from The National Board of Fire Underwriters, 222 W. Adams St., Chicago, Ill., for 13 cents. This price includes the supplement

check of individual stairways showed the "down" units to be returning power to the line during appreciable periods of operation.

To make certain of this condition, the recordings were made during three peak seasons of the year. Moreover, seven groups of stairway units, and eighteen individual units were checked over periods of several days to insure accurate results. Graphic metering of the individual units to determine current, power and voltage provided definite data regarding voltage levels and voltage drops on starting. It was finally concluded that, although the connected loads approximated the horsepower ratings of the respective feeders, reduced demand factors of 40 to 60 per cent could safely be applied. Eventually this will provide much needed 3-phase feeder capacity for future constantly loaded equipment.

In this particular survey, the overall plant power factor was found to be well above 85 per cent, a level generally accepted as being economically satisfactory. At the same time, in the course of metering the various power loads, it was found that some groups of machines were operating continuously at as low as 40 per cent power factor. Others were operating at 50 per cent, and several at 60 per cent average. When these machines were installed, the feeders and transformers had not been heavily loaded and, evidently, voltage levels had been within acceptable limits. At the time of the survey the conditions had changed materially. It was, therefore, important to seek ways and means of increasing transformer and feeder reserve capacities and to raise voltage levels.

One bank of electric stairways was found to be running with a maximum demand of 90 kw at 51.8 per cent power factor, or 173.8 kva. By the application of a total of 98 kvar of standard 230 volt capacitors, comprised of small units at each motor, the demand could be reduced 55.6 kva and the power factor raised to 76.5 per cent during the short period of maximum demand. This correction would raise the power factor to 86.0 per cent during the period of average demand, which prevailed most of the time, and reduce the value of the average demand by 53.4 kva.

The significant feature of the above is that the reserve feeder capacity is increased 55.6 kva. The transformers were carrying a demand of 2300 kw at 90.9 per cent power factor, or 2533 kva. This demand would be reduced 28 kva, or 20.7 per cent of the total demand presented by this bank of stairways.

If this feeder were loaded to 85 per cent of rated capacity with the additional loads at 85 per cent power factor, power factor correction at the stairway motors would reduce the demand at the transformers from 2598 kva at 90.8 per cent power factor to 2567 kva at 91.6 per cent power factor. Then it would be possible to supply an additional 40.2 kw demand load at 85.0 per cent power factor, or 47.3 kva with the resulting total kva demand on the transformers being the same as it was before power factor correction was applied. This additional load is equivalent to 48.5 hp at 90 per cent efficiency, 85 per cent power factor and 100 per cent demand factor. These are real and tangible benefits.

On the other hand, there are also intangible but real benefits, which are difficult to calculate exactly. These are the improvements in service which the utility or power plant is able to provide. It also brings about more satisfactory voltage levels and, consequently, more efficient operation of power and lighting equipment.

Rescheduling of various types of loads often is necessary to bring about reductions of maximum demand. For effective planning of load rescheduling there must be available definite knowledge of kilowatt demand values and the uses which make up the major loads. The kva demands, as to magnitude and time, also should be known in order to successfully cope with problems of arranging and rearranging branch circuits and feeders to accommodate alterations in plant equipment layout. It may be necessary to supply equipment from an existing distribution system after the equipment layout has been changed. Here, again, accurate knowledge of nature and scheduling of loads which are taken by individual machines, or groups of machines, is of inestimable value.

It is always possible, and certainly safe, to provide so much capacity in a plant distribution system that any plausible combination of machinery could be supplied by it. But for many plants this is hardly economical. So, the plant engineer must determine how he can, by taking utmost advantage of existing electrical system and equipment operation, effect efficient plant functioning with low capital investment. This will tend to increase efficiency and productivity all down the line.

Many plant engineers have prepared plans for plant changes but must delay action on them until they can be effected economically. Inasmuch as it is desirable to maintain wages at their present levels, material costs certainly cannot be reduced. The answer to the problem, therefore, rests with the plant engineer; he must increase efficiency. This, in turn, requires more and better engineering analysis of the plant systems on which work is needed. To reduce such costs appreciably, the man-hours for each project must be reduced.

Results obtained from metering two particular power feeders will serve to illustrate the points in mind. One was that for the bakery, and the other that for a large group of motors. The wattmeter recording for the bakery feeder is reproduced here as Fig. 3. In this particular case, the information acquired served as a warning. The maximum demand occurred early in the morning during the baking period. However, should it become necessary to increase the baking period, that period could not be permitted to extend very much later during the day without appreciably increasing the plant maximum demand.

## Fire-Resistant Overcoat for Steel Beams

Photo: Eagle Picher Co.

In industrial fires, steel beams often twist out of shape, damaging buildings beyond possibility of repair. A new fireproofing cement to prevent this is shown in the photograph. The beam is first wrapped with metal lath as shown at the left and the special cement is then troweled into place to form the smooth, fire-resistant coating shown at the right

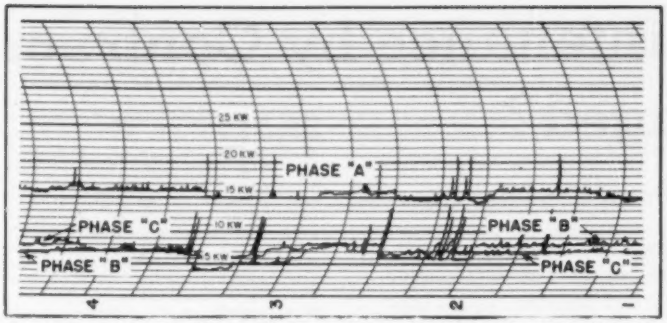



Fig. 2. Single phase load balancing was made possible by use of records. This one is a composite drawing of three single-phase records

In contrast to this, the second feeder to be analyzed already had a connected load exceeding its rating. However, a large part of this equipment was for carpentry work, which has a high degree of diversity, and which is somewhat seasonal in use. Some of the connected machines were laundry equipment and others were fans and pumps. Now, although the maximum demand did not exceed 75 kva there were frequent starting peaks which reached 158 kva. As a result, in spite of a low average demand factor, these high peaks limited the use of the feeder.

Plans for installation of additional machinery in the carpenter shop and laundry would seem to indicate the necessity for installing an additional feeder paralleling the existing feeder. This was made unnecessary by taking advantage of the diversity of operation of the many motors. With all of these on one feeder and the constantly loaded machines on a separate feeder it was possible to better utilize the available capacity of the feeders. By transferring these loads to the new penthouse transformers and splitting the existing feeder at the desired point of division, it became necessary to install only two relatively short new connecting feeders, and more than double the effective capacity of the two.

Electrical equipment is designed to operate at specified voltages, and, at the same time, is generally given ratings corresponding as nearly as possible to points of maximum efficiency at that voltage (usually points of compromise between maximum efficiency and maximum power factor).

It is important, therefore, that distribution system voltage levels be maintained as near design values as reasonably possible. Latitudes of 2 to 10 per cent, under or over rated values, are tolerable in various kinds of equipment, the lower values for lighting and heating applications, and the higher values for motors. A maximum of 5 per cent is the greatest deviation that should even be considered when installing a new system. Yet, there are many systems with extremely low voltage levels. In such cases, should the plant engineer assume that a line is either over-loaded or excessive in length and merely settle the question by installing a larger or a parallel feeder? In some instances, of course, this is the correct answer; but in many it may only obscure a defective condition in the system.

In the survey under discussion two general causes of excessive voltage drops were discovered, after careful recorded simultaneous metering had been made of several points along a feeder. The first was in circuit breakers. Here the contacts had not been cleaned often enough and the trouble was first manifested by undue heating at the main panel. The second was in a combination of multiple feeders so arranged as to take advantage of diversity in motor loads. The paralleled feeders, 100 ft in length, took due account of voltage drop up to their terminating bus. Provision had also been made for spare current-carrying capacity.

However, three groups of motors, plus cooking equipment for a kitchen, were fed at various distances beyond this sub-panel, each of these through separate circuit breakers, and eventually through additional protective and switching devices. One group of 20 motors, totalling 321.4 hp in rating consisted of two motors approximately 50 ft from the sub-panel, and the remainder in pairs at 15 to 20 ft intervals. The second group (5 motors) totaled 300 hp and was located 350 ft from the sub-panel. The third group (5 motors) totaled 300 hp and was located 450 ft from the sub-panel. These distances refer to feeder lengths.

The sub-panel feeder was comprised of five 600 mcm conductors in parallel; the feeders for the first group of motors were two 500 mcm conductors, but not paralleled (each supplies half the motors); and for each of the other two groups there were three 500 mcm conductors in parallel. The other loads did not exceed 25 kva demand.

The original design of this part of the system should be more than adequate for the connected load. Yet, even though the maximum demand was not over 250 amp per 600 mcm feeder, for which a drop of 2 v would be expected in 100 ft the actual drop was found to be 5 v, as a prevailing average. Under starting conditions, when a single 60 hp motor would take 500 amp for as long as 3 sec, the voltage at the motor group circuit breaker panel was observed to drop 3 to 4 v. This was in addition to a 4 v drop in the three 500 mcm paralleled feeders which held fairly constant for average running conditions.

Thus, if there were actually 208 v at the main bus, the voltage at the motor terminals would probably be 194 v, allowing 1 v drop in the branch circuit wiring and local contactor. This is a 6.72 per cent drop. Under more severe conditions of loading on the primary network, the voltage at the main bus frequently fell to 203 v and less, and at the motor terminals 188 to 189 v. On starting, the drop increased even more, with extreme low readings of 179 v occurring when starting loads and heavy load peaks for other motors coincided. This condition brings about excessive heating in motor windings. From this data it became apparent that there was definite need for improved maintenance of circuit breakers and feeder connections.

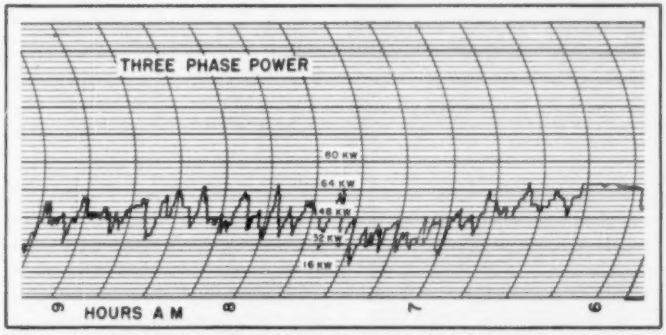



Fig. 3. Another advantage derived from system and meter records is determination of time-load factors to plan for future loads or avoid overloading

# Should Maintenance by Contract Be Encouraged?

## III. More of the American Viewpoint

**Comment by five representative engineers . . . Contracted work costs more, says one . . . The over-all cost may be more, says another . . . Maintenance men are misled by their own omissions, says a third . . . There is a place for both, says the fourth . . . Each plant must make its own decision, says the fifth . . . Management policy, accounting practice, plant size, type of work and even personnel hobbies are important factors in the decision of whether to do it or farm it out**

MAINTENANCE by contract or more broadly the use of any outside contractor or service to supplement the regular plant crew was discussed in the July issue (page 40) from the standpoint of opinion and practice in Great Britain. Comment by six representative members of the Incorporated Plant Engineers disclosed widely divergent opinions.

This was followed by an article in the September issue (page 42) giving the results of a survey made among American plants and presenting the comments of four representative American plant engineers. The survey showed that the use of some type of outside service is practically universal, and, would be utilized more widely if more adequate services were available.

By and large, individual opinion confirmed the result of the survey data. Opinion is not unanimous however as to the desirability of, or necessity for, the practice. The following additional opinions by five individuals, and selected from the many letters received commenting on the series, disclose different viewpoints. Collectively, they indicate the need for good management and cost accounting practice in connection with this particular practice.

**Contributed by**
**Harry W. Benton, Plant Engineer, Pratt & Whitney Div., Niles-Bement-Pond Co.**

THE SEVERAL opinions as expressed in the July issue are interesting because they indicate indecision. Indecision usually arises from a lack of information or weakness on the part of someone to face the issue and make a decision, based on the information available. A lot of controversy is like people waving their arms in thin air, making a lot of commotion, and getting nowhere.

Let's deal with facts. Why, and what for, are business organizations and manufacturing plants established and kept in operation? Someone will say to produce something the public wants, and, while the production is important it is, nevertheless, but a means to an end, the end being profit.

There are two general types, or classifications of expense in industry, namely; production expense; and non-production expense. Regardless of the intricacies of methods used by cost accountants, I personally, like the classification of productive labor on the following basis namely: all labor entering into the conversion of raw materials, as purchased, into the finished product as sold, is productive labor; all other labor, regardless, is nonproductive labor. This same classification extends further: all materials purchased that enter into and become a part of the product manufactured and sold are productive supplies and materials; all other supplies and expenses that do not enter into and become part of the finished product as sold are nonproduction materials or supplies.

The sale price of a product must include all the costs of manufacturing, plus an allowance for obsolescence of plant equipment, depreciation of all forms, insurance, taxes, sales expense and finally profit.

It is the duty of management to: regulate and control all elements of cost so that the plant and equipment can be maintained in first class condition; lay aside regularly an amount representing the depreciation of plant and equipment; and manufacture a product at a price to meet competition, to pay to stockholders a fair dividend on their investments, and pay their employees as fair a rate of pay as is possible or consistent with all angles having to do with price levels.

It is obvious that if nonproduction expenses climb up, some other factor must go down. In other words if the operating costs get high, profits must be reduced and the stockholders are just as much entitled to reasonable interest on their investments as the workmen are entitled to fair compensation for their services.

**Even though this work should require the service of only one man part time it still should be, and could be, done at less cost than by an outside contractor . . . plant work by outside contractors is . . . poor management**

Therefore, management must avail itself of the most efficient method of plant maintenance so that maintenance expenses can be kept at a minimum. This then presents management with the question: Which is most efficient, outside contractor maintenance services, or, maintenance services under their own direction? Unquestionably the latter is best. In the first place, the outside contractor is in business for profit and every dollar's worth of service rendered must be included in the profit margin or the contractor could not stay in business.

No matter how small an industry may be, there is still a supervisor somewhere in the organization who could supervise the maintenance of plant machinery and equipment. Even though this work should require the services of only one man part time, it still should be done, and could be done at less cost than by an outside contractor.

If we go up the scale to medium size plants and larger plants, the more maintenance work costs and the greater are the responsibilities and diversities of requirements so that in the larger plants the services of a capable plant engineer is necessary. Under his direction various crafts are organized for the performance of different types of work for the maintenance and operation of the plant.

The larger the plant, the more of a business problem does plant engineering becomes and it is positively true that this department should be part of the non-productive organization, reporting directly to top management. The department should be equipped to render all services required, with sufficient cost office cooperation to properly control costs and keep these costs within an approved ratio with relation to the number of productive employees in the plant.

In my opinion plant maintenance work by outside contractors is an evidence of poor management rather than failure of the plant maintenance department.

**Contributed by**
**Fred L. Leason, Jr., Plant Engineer, Interstate Bakeries Corp.**

THIS QUESTION of Maintenance by Contract, in my opinion, depends upon two things: cost and personnel. In speaking of cost I mean primarily from a dollars and cents standpoint however, there are times when outside maintenance will cost more in money but the benefits obtained, such as time saved by use of larger crews, having a job done during one of the few shutdown periods over a year, etc., will offset extra monetary expenditures.

I am thinking of Personnel in the

**There are a number of items or services that can be done outside . . . (and) . . . if you examine costs honestly you will find some things that could have been contracted for at lower over-all expense.**

broadest possible sense, the ability of maintenance men, supervision, attitude and cooperation of production men in your own plant and the ability and supervision of the contracting firm employees. Experience has been in a plant of some 500 employees in a food processing industry with 30 maintenance employees under supervision of the plant engineer and a foreman.

Exterior building maintenance is contracted for on the basis of doing something each year so costs do not pile up while maintaining the building properly. Until recently we took care of our own interior painting but on checking costs, our labor and material equalled the quoted prices of outside contractors. This meant that our men put more man hours into a job than the outside contractor.

In some respects we got a better job but there are two primary reasons for this manhour discrepancy. The first is lack of proper supervision of the painting crew who, unless watched, were inclined to slow down. The second reason goes back to plant personnel whose attitude is best indicated in the following incident. Two years ago we did some extensive floor repair work with an outside contractor. It meant that almost all production machinery not hung from the ceiling, had to be shifted from time to time to make certain areas available for the floor men.

Production was going on 24 hr per day, six da per wk. Plant production personnel knew these outside men were being paid a high rate and literally jumped all over themselves to rearrange their schedules and their machinery in order to keep space open for the outside men so the job could be completed quickly and the costs kept low.

When it came to doing a paint job with our own painters, these same plant production men could not recognize the same cost problem. We were forced to jump from one area to another, pick up our scaffolding and dropcloths, and move many more times in the course of doing a floor, than was necessary if things had progressed in a more methodical way. Our own painters were much more flexible than outside men, perhaps too flexible.

We had been contracting our refrigeration and air conditioning work barely satisfactorily with one outfit and contacted several other contractors who hesitated to take on all of our work. As a result, we have been doing our own with much less trouble, fewer replacements, little or no down time. With the exception of new installations we have reduced our costs materially with better workmanship. This is a personnel angle favorable in our plant and unfavorable to the contractor.

Instruments and controls are inspected and serviced regularly through manufacturers' service departments; the cost is negligible and the inspections are a form of insurance against down time. If you have a good electrician and instrument man he could undoubtedly do the job. However, in multiplant operation, manufacturers' service inspections can do much toward insuring uniform processes and product. Electric motors and control are part of our own regular maintenance program on machinery, elevators also.

I believe the amount of work and type of work contracted for depends upon the number of specialists in an engineer's crew. The larger the plant the more specialists in the crew and the less work that has to be done by outside men. However, maintenance by contract does not detract a thing from the plant engineer's importance. His job is to get things done and keep costs down, and, there are a number of items or services that can be purchased cheaper outside than if they were made or done by plant personnel. In some cases, top management will have to be sold on this but if you will examine your costs honestly you will find some things that could have been contracted for at lower overall expense.

**Contributed by**
**A. Levine, Asst. Chief Engineer, Condenser Service & Eng Co., Inc.**

INTEREST IN the series of articles on Maintenance by Contract has been considerable since my company specializes in maintenance work by contract on heat exchangers. Whatever may be said about the specific duties of a plant maintenance organization, the primary consideration is surely that work should be accomplished at a minimum of overall cost and in a minimum of time.

**Plant maintenance men have been . . . unaware of much more economical services . . . If the annual cost of carrying a maintenance crew, insurance, etc., were added to the cost of tools and materials . . . in excess of requirements, there is no doubt of which would be the more economical**

In reviewing the second article of the series, it is noted that Table 2 indicates that heat exchanger repair services would be used by an average of approximately 10 per cent of the plants answering your questionnaire. The writer can, without hesitation, confirm this figure. The reason for this low percentage is that plant maintenance men have set up to do heat exchanger repairs because they have been totally unaware of much more economical services from outside organizations.

It is surprising how many engineers, in comparing their maintenance costs with contract maintenance costs, are misled by their own omissions. A point made by one engineer was that it took him "only" X hours to do the job, but he did not take into account the considerably longer outage time, and the employment of a maintenance crew who were idle most of the time but who had to be augmented with additional help and overtime when a breakdown occurred. If the annual cost of carrying a maintenance crew, including wages, insurance, etc., were added to the cost of tools and materials purchased and stocked in excess of requirements, there is not the slightest doubt that contract maintenance would be found far more economical and effective.

A heat exchanger is an extremely specialized piece of equipment, and requires the attention of highly trained men using specialized tools. The writer's experience has been that the tools used for heat exchanger repairs by the normal plant maintenance department are extremely crude and do not represent the latest techniques in the industry. This is no surprise, since many of the tools are trade secrets and have been developed by individual companies over long periods of time.

A trained crew can effect heat exchanger repairs, such as retubing, in far less time than a plant maintenance gang. More often than not, the price of a heat exchanger repair is not the most important consideration. The most important consideration, especially in an industry using a continuous flow process, is outage time because the outage may mean an interruption of the process or a possible reduction in the efficiency of the process and the quality of the product.

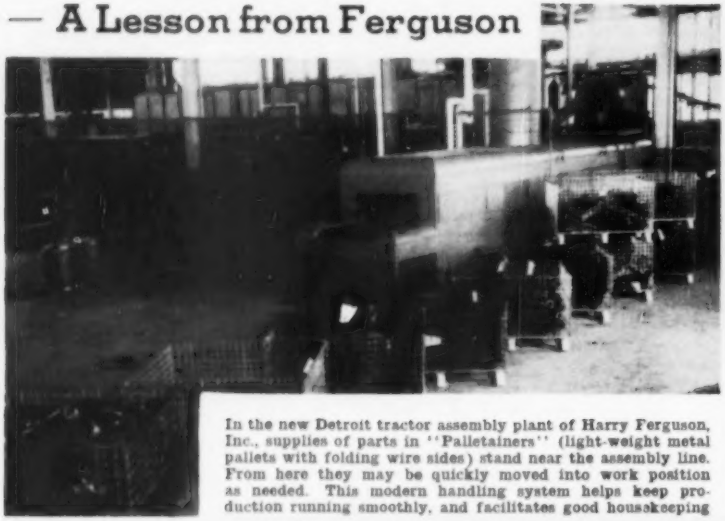
While the writer's experience has been in heat exchanger work, which includes condensers, evaporators, boilers, coolers, heaters, etc., he feels certain that other specialized fields also have outside re-

*(Continued on page 69)*

**"You have an emergency repair call in here? Oh, yes! In there — jammed zipper!"**

# PALLETS for PROFIT

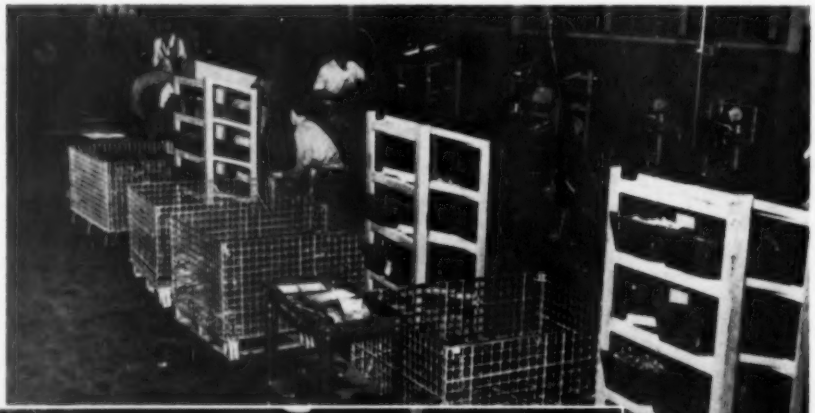
## — A Lesson from Ferguson



In the new Detroit tractor assembly plant of Harry Ferguson, Inc., supplies of parts in "Palletainers" (light-weight metal pallets with folding wire sides) stand near the assembly line. From here they may be quickly moved into work position as needed. This modern handling system helps keep production running smoothly, and facilitates good housekeeping

Seven high! Palletainers containing unit loads of light material have actually been stacked this high in the Ferguson plant, providing visible inventory even in this unusual parts storage case

Right: Palletainers standing at the assembly line, from which workers take parts as needed. Pallets and Palletainers (folded flat) are returned to parts suppliers. New parts are returned in these units, designed to be handled by fork truck. They are unloaded, stored, and moved into work position with no further handling required. Such modern use of pallets should be widely adopted in the event of general lowering of freight rates on empty pallets being returned



Photographs: Union Steel Products Co.

Left: Heavy, small parts such as bolts and nuts, packed in kegs, are shipped on pallets, unloaded and stacked in storage by fork truck. They are moved to final assembly position on the original pallets

# Plant Waste Segregation Cuts Its Disposal Costs

**When paying for sewers why not use them, if possible . . . Heavy capital expenditure avoided by this company through simple segregation and neutralization of its wastes . . . Equipment involved consisted of two detention tanks, orifice box, pumps and small runs of piping . . . Closer water control a bonus feature of the segregation system**

INDUSTRIAL PLANTS, through various taxes, pay a sizeable share of the cost of building and maintaining municipal sewer systems and sewage treatment plants. Why not, then, take advantage of its right to use these facilities in disposing of factory wastes?

Municipal policy usually permits such industry usage, provided the sewerage can accommodate the added load, and the wastes do not damage the sewers or treatment plant or interfere with sewage treatment processes.

In many instances, however, industrial management decides prematurely that this approach to waste-disposal difficulties is not possible in the particular case at hand, and sets out instead to do the more difficult—and oftentimes expensive—thing: Handle the plant waste load as a private industrial headache.

An example of the more economical approach is the new waste-disposal procedure now operating at Chester Lace Wks. It was faced with the problem when it could no longer dispose of liquid wastes in near-by Morton's Run, which empties into the Delaware River. To continue the practice would have entailed a substantial capital expenditure for treatment of the liquid wastes to make them acceptable under Pennsylvania sanitary regulations.

The solution developed by chemical engineers of Hall Laboratories began with this common-sense approach to the problem: Determine the total water consumption, nature of its use and resultant liquid wastes, character and volume, then apply the old political maxim, "divide and rule" to the variety of wastes.

The liquid wastes proved to be classifiable as "very dilute," "dilute," and "strong." The first two could be disposed of without treatment. To mix them with the strong wastes would unnecessarily build up the total volume of liquid wastes requiring special attention.

The strong wastes could be made acceptable for admittance to municipal sewers by 1. partially neutralizing them and 2. regulating the volume of their discharge so as to avoid overloading the city system.

Two detention tanks, located beneath the bleachyard floor, receive the strong liquid wastes by gravity flow from the kiers and associated equipment. This arrangement made elaborate piping and pumping unnecessary. Waste liquids from such operations as "wet-out," rinsing, kiering, bleaching, "acid-sour," washing, starching and dyeing are composited in the detention tanks, which have a combined capacity almost double the estimated maximum strongwaste volume produced in any one mill-operating day.

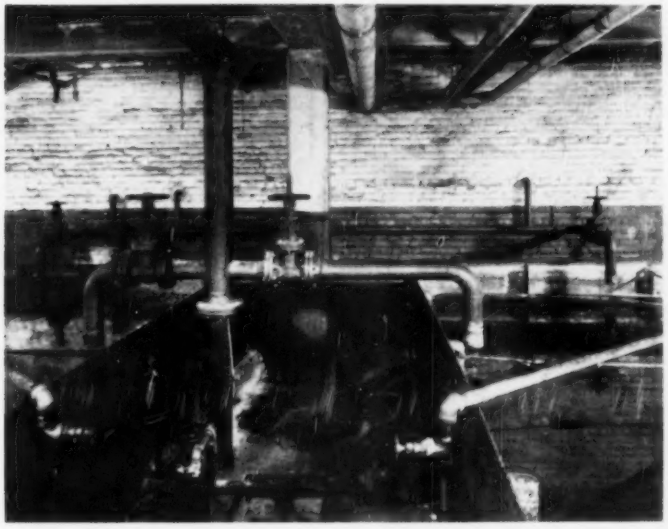
Two tanks are operated on a fill-and-draw basis. All the strong wastes are dumped initially into one detention tank. At the end of the day, the operator tests the waste to determine approximate pH.

When he has determined the amount of acid needed to adjust the pH of the liquid waste to pH 8, and added the required volume of 50 per cent acid for the purpose, the operator switches on a small industrial pump, running it for one hour to mix the wastes and neutralizer.

The neutral liquors may then be discharged at a controlled rate, along with the dilute and very dilute wastes, to the municipal sewer system.

Discharge of the effluent is by pumping; gravity flow was ruled out because the slope would be too small. Provided for the purpose were a heavy-duty duplex screenless sewage ejector, with a discharge capacity of 450 gpm.; and a 6 in. cast-iron line to a brick manhole at a near-by street corner where the effluent enters the city sewerage system.

Total initial cost, and operating cost, of the new disposal system for the liquid wastes were far lower than the alternative, that is: Treatment of the liquid wastes equivalent to the primary treatment of municipal sewage.



**This close-up view of the piping to and from the detention tanks shows the kier liquor header along the wall in background which collects this waste from kier floor beyond and feeds it to the detention tanks, the bleachyard waste line, the large diameter pipe dropping from the ceiling in the foreground, which brings this waste from the bleachyard floor above; piping arrangement for blending wastes and neutralizing chemicals (these are the diagonal pipes in right and left foreground); orifice box, center foreground, which controls discharge of neutralized wastes to the sewer**

# MAINTENANCE WELDING
## Planning, Equipment and Operation

**Nature of operation requires mobile equipment, trucks, "doodlebugs," and careful scheduling of jobs . . . Emergency operation and ability to improvise are necessary . . . Maintenance welding one form of preventive maintenance . . . Importance of hard-facing in maintenance work . . . Shape-cutting machines are important tools in maintenance shops**

By **FRANK J. GAYDOS**, Maintenance Welding Engineer
Carnegie-Illinois Steel Corp., U. S. Steel Subsidiary

AT CARNEGIE-ILLINOIS in Gary, Indiana, day-to-day maintenance and field erection assignments are planned the day before. Each department, such as structural, electrical, machine and pipefitting, sends a list of jobs and locations to the welding department. The same practice is followed by the operating units who need welding service for the millwright crews. The field foreman lines up the personnel and makes up a list of machine moves which must be made during the midnight turn. A truck service is maintained by the welding department for transporting men to the more distant locations for emergency repairs and for delivery of oxygen or acetylene tanks, weld rods, or other equipment as required or as job needs develop.

Occasionally breakdowns occur and a distraught operator frantically calls for help. It may happen that the field foreman has all available manpower and equipment out on scheduled jobs. He, therefore, finds himself with an intriguing problem of moving men and equipment around like checkers. These are the times when versatility, portability of equipment and ability to improvise are important. We have found that our so-called "doodlebugs" are the kings in this checker play. These units are shop mules with 300-amp welding generators driven from a power takeoff and equipped with oxygen and acetylene tank carriers, cable reels, and containers for electrodes and supplies. The units are of sufficiently narrow wheelbase to maneuver in cramped places.

Such units are more expensive to operate than standard equipment, as is the case with any gasoline-driven equipment because of the cost of tires, motor and drive repairs, gasoline, oil, anti-freeze and other items, but the extra cost is absorbed in savings made in the time involved in getting to the scene of action and in the ability to get a mill back in operation rapidly. It is not economical to operate gasoline-driven equipment where welding operations are prolonged, where high amperages are necessary, or where electric current is available. In those cases, the "doodlebug" will start a job while a conventional electric motor-generator machine is being trucked to the job and connected to a power line. The heavier machine then takes over and the "doodlebug" moved off to another assignment.

The electrodes used for emergency repair work are principally the AWS standard E6012 for low heat input, the E6010 rod to provide more fluid metal for getting through rust and on pipe work and since their advent, the hydrogen-free rods now known as E6015 for questionable conditions and use on higher carbon steels and castings.

Optimum welding conditions are

From a paper presented before the Chicago Section, American Welding Society

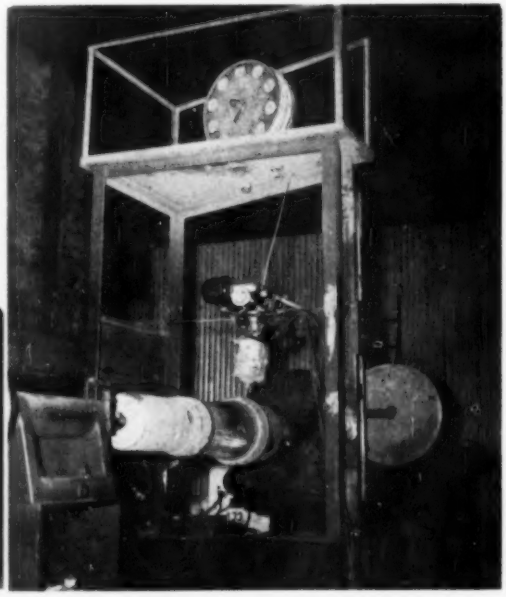
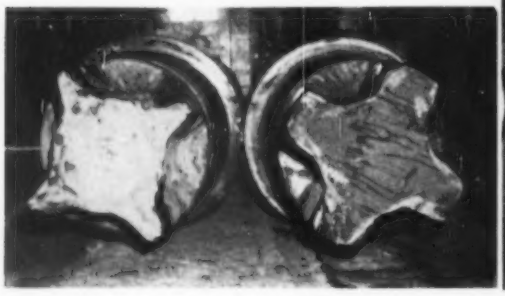


Fig. 1. **Below**: These two wobblers of a slab mill roll went into service at the same time. The one on the left was installed "as cast" while the one on the right was hard-surfaced before being put into service. Reconditioned wobblers now last for the life of the roll

Fig. 2. **Right**: A sufficiently large lathe is of considerable help in building up journals, shafts and other round pieces. Manual build-up frequently results in uneven contour of part being worked on



seldom encountered. Because of the heat conditions, cooling and lubrication requirements of the operating units, the work places are not as neat as a pin, but are likely to be rather messy even though operators expend much effort to keep their working areas as clean as operations will permit. Under such conditions, however, maintenance welders develop their judgment by working on grease-covered and rusty pipe and equipment. Further, the necessity for working of steels varying in composition from 0.08 to 0.80 per cent carbon requires a detailed knowledge of rod types, techniques and procedures.

The ultimate goal of maintenance welding is not merely to get the mills fixed, which may be taken for granted, but is rather to prolong the life of mill elements, to eliminate breakdowns as far as possible, to avoid mill delays, expensive repairs and replacements, and, in general, to strive for still further progress in the field of preventive maintenance.

Figure 1 illustrates what happens on the wobblers of a 36-in. slab mill roll. The two rolls went into service at the same time, but one had hard-faced surfaces while the other was used "as cast."

Achieving a satisfactory result with hard facing took considerable study, for the build-ups had a tendency to pull away from the 0.35-0.40 per cent carbon steel used in the wobblers. After some study, we discovered that the trouble lay in the base metal itself. The parts being built up had been under continual impact and the metal was in fatigue. This condition was overcome by scarfing off this battered metal and building up on good solid base metal. Generally about $\frac{3}{4}$-in. of metal is removed before the minute stress cracks are obliterated and a solid base exposed. We then build up with a 0.25 per cent carbon E6012 electrode and finish off with a pass using a moly or nickel-manganese steel electrode.

In work of this character, welders must adhere strictly to templet sizes after properly centering their layout, and then grind the work to size. This care in rebuilding eliminates the necessity of machine work. One reconditioning now lasts the life of the roll and since much of the wear and tear is avoided, as well as torsion of the operating parts being lessened, the mill operates more smoothly. This, in turn, plays its part in increasing mill performance and quality, and certainly in reducing repairs and breakdown losses in operation.

Preventive maintenance is important in this connection, for it is not necessary to wait until the wobblers are worn to knife edges. Hard-facing can be readily applied to a new wobbler before it goes into service by merely scarfing off the foundry mold crust and applying one, or at most two, passes of hard-facing material.

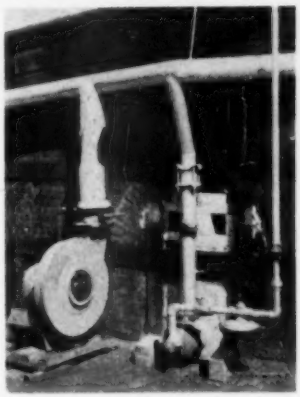
## Gas is Helping To Make Better Bricks at Summitville

**Contributed by O. O. Todd, Mfgrs. Light & Heat Co.**

OUR COMPANY, in pursuit of information on possible advantages of the use of natural gas for the production of bricks, was fortunate to enlist the cooperation of The Summitville Face Brick Co., Summitville, Ohio. We set up a 4-in. high pressure, inspirator type mixer with a flame-retention nozzle firing through a tuyere block. The tuyere block and burner nozzle were mounted at a 45 deg angle which directed the flame toward the crown of the kiln.

Nozzle and block were placed so that the flame passed directly into the kiln interior without impinging on the firing mouth arch or the bag wall. This placement moved the heat out of the firing mouth and lowered bag-wall and firing-arch temperature. Also, it reduced kiln maintenance to a minimum.

The grade of brick produced in the kiln has been pleasing. There has not been a single flashed brick; they are clean and free from fly ash and are not stuck together as much as with coal firing. They are more easily removed from the kiln. Fuel cost thus far has been at the rate of $2.02 per ton of brick.



**Merits of both inspirator and luminous flame burners in kiln operation were explored by installations similar to above. Note blower at left that delivers air under pressure to each firing mouth**

Another hard-facing application, to combat combined pressure and hot abrasion, is in connection with slabbing and blooming mill hydraulic shear knives. Tong bits, used in stripping ingots from molds, formerly lasted only eight hours and sometimes less. These bits were redesigned at points of highest stress and the contact edge hard-faced. This treatment increased the life of the bits to approximately 320 hours of usage. With the additional life, higher tong pressures were realized, which greatly decreased the percentage of "stickers." This, in turn, cut stripper operation time, which allows the ingots to get to the soaking pits at higher temperatures.

The foregoing are merely a few examples of preventive maintenance work involving the use of hard-facing applications. All around will be found chances for improvement. Those mentioned were big jobs, but one should not forget the small parts, guides, dies, pusher rods, and similar pieces where the application of a little "blob" of hard-facing will save time and assure smoother operation by increasing the life of a piece.

Hard-facing problems are not too easily solved, nor is any one rod the panacea and cure-all for wear problems. Each application needs study and experiment to develop proper base materials and the correct electrods or rod, pre-heat, post-heat, and welding procedure. Sometimes

**Fig. 3. Shapecutting machines are of importance in this maintenance shop. Blanks for finish machining and final heat treatment are cut in this department. Items produced include gear, sheave and pulley blanks, pipe flanges and wearing plates**

a low-priced rod will do the job, while at other times rods costing several dollars a pound are necessary. Proper usage and application, however, often make the higher priced rods the least expensive. These are some of the challenges encountered in maintenance welding and their solutions are rewarded by increased production and savings in product cost.

In most instances the elements being built up are round. Manual build up commonly results in uneven contour, cresting high and low spots and a tendency to overweld. This condition is detrimental to machine tools and consumes too much machine time in finishing.

A lathe of sufficient swing and length to take a large part of the work encountered, equipped with an automatic welding head, is ideal for handling these circular jobs. Such a unit is shown in Fig. 2. Its use will produce savings of up to 60 per cent of the labor costs in weld metal deposit alone although the wire cost is slightly higher. Most of the work at Gary is built up with wire depositing a 0.25 per cent carbon overlay although some applications of harder metal are made. This type of build-up is sufficiently hard to take care of normal requirements of wear, friction and machinability. The deposit is uniform and concentric, with bead layers overlapping nicely and produces an easily machined surface.

The steel mill maintenance department will of necessity perform welded fabrication work. Many patterns are scrapped after years of disuse, so replacements are commonly fabricated of steel plate.

Portable and boom type shape-cutting machines, Fig. 3, are important tools around a shop. Rolled steel of various compositions is used to produce shapes and blanks for finish machining and final heat treating, such as gear, sheave and pulley blanks, pipe flanges, liners, wearing plates, pug mill blades and similar items. A substantial saving was made in our shop by shape-cutting entry and delivery guides, which are used by the thousands in the rail and merchant bar mills to guide the product being rolled through the various mill passes, each rolled section and pass having a guide for its peculiar shape. These are flame-cut from 0.45 per cent carbon plate. Formerly these guides were forged, at a substantial cost per piece. Shape cutting, however, results in low unit cost per guide, especially if multi-torch cut. Likewise, the operators are able to obtain guides on short notice, which affords them opportunities for greater flexibility of rolling schedules. Another example of the application of multi-torch cutting is in the production of steel wedges $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by 6 in. long which are used by the thousands in connection with the stripping of ingots.

# How To Choose Pump Materials

**Part II** . . . General discussion on limitations of cast iron when used for pump casings . . . Limitations on use of bronze for fittings . . . Factors affecting material selection . . . Peripheral speed limitations**

By **IGOR J. KARASSIK** and **ROY CARTER***
**Application Engineers, Worthington Pump & Mach. Corp.**

CAST IRON AT normal temperatures has definite strength limitations and a cast iron pump casing of a given design will have a definite pressure limit. If higher pressures are encountered (either through operation at higher than design speeds or through the existence of high suction pressures), the design must either be modified to obtain greater strength, or a metal such as cast steel, which will withstand greater stresses must be substituted for the cast iron.

Occasionally pumping systems are subjected to water hammer or shock pressures far in excess of the normal operating pressures and a stronger metal than cast iron is necessary.

While theoretically it is possible in some cases to use a cast iron casing under high pressure, the thickness of metal required would not be satisfactory from the point of view of foundry practice. In some cases, substitution of thinner cast steel sections for heavy cast iron casings may compensate for the higher material cost, almost to the point where use of cast steel is the more economical solution.

Cast iron loses tensile strength and becomes quite brittle at low temperatures. For this reason, in pumps handling liquids, such as brine, at very low temperatures the pump casing is generally made of alloyed cast iron or cast steel.

Insofar as temperatures are concerned, it must be considered that the repeated heating-up and cooling-off of a pump handling a hot liquid will aggravate any minute imperfections in either iron or cast steel casting. There is no absolute certainty that an originally tight casing, of either material will remain tight after the unit has been in service for an extended period of time. If a leak does develop in a cast steel casing, it can be corrected by welding while the same process may be impractical in the case of a cast iron casing.

It must also be considered that in high temperature and high pressure pumping systems, the piping is generally made of steel and, as it would not be desirable to have a pump casing weaker than the piping itself, steel casings are generally preferred. Even in the matter of pipe connections, the selection of the casing material plays a part, as it is not recommended to use cast iron when raised face flanges are used on the connecting piping.

While each design of centrifugal pump has its own pressure and temperature limitations, there is an upper limit where practical and economic reasons dictate the use of cast steel regardless of pump design. Thus, cast iron casings are seldom used for pressures over 1000 to 1100 psi and temperatures over 350 F.

**Semi-Steel**—There is no such metal as semi-steel, since ferrous metals must be either steel or irons and the difference between the two is strictly defined. The name has, in the past, been frequently applied to high grade cast irons with a tensile strength of approximately 45,000 psi —half-way between the 30,000 psi of ordinary cast iron and the 60,000 of carbon cast steel. Such high grade cast iron is frequently used by pump manufacturers under various trade names instead of ordinary cast iron for pump casings or other pump parts subjected to temperatures or pressures somewhat higher than normal. This iron is generally made in the cupola, using a high percentage of steel scrap.

**Temperature Limitations**—Bronze expands approximately 40 per cent more than steel. Since pumps are assembled at normal room temperatures, the original radial clearance between the hub of a bronze impeller and a steel shaft will increase

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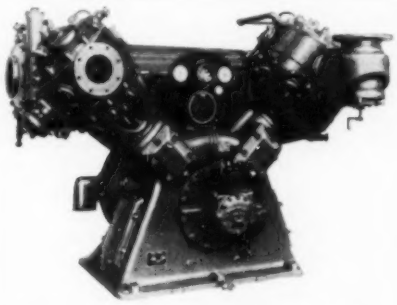
**Part I appeared on page 37, December, 1949 issue.

Here's a **RUGGED HEAVY-DUTY MACHINE** that supplies large air volumes with *GREATEST EFFICIENCY!*

# JOY WN-114 AIR COMPRESSOR



*The JOY WN-112 is a two-cylinder, heavy-duty, continuous type unit, having all the features of the WN-114. It delivers 368 to 1828 CFM, up to 3656 CFM in twin units.*

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under operating conditions if the pumping temperature is above normal. This increased clearance can act to loosen the impeller on the shaft and introduce the possibility of leakage and erosion. In addition it must be remembered that the impeller assembly must be held axially by means of shaft nuts or shaft sleeves which themselves are fixed on the shaft by means of external nuts.

If the axial assembly is made tight under cold conditions, the unequal expansion of the impeller hub and of the shaft will cause "crushing" of the bronze impeller hub and may even set up severe stresses in the shaft itself. If the assembly is made so as to be tight under operating temperature conditions, the impeller will be loose at low temperatures and there is no possible provision for holding it in accurate axial alignment until the pump becomes heated.

Finally, if there are changes in the operating temperature, it would be impossible to keep the assembly tight at all temperatures without setting up excessive stresses.

These possibilities are removed when the pump fittings are such that the expansion of the shaft, impellers, and sleeves is equal. For these reasons, bronze is generally not used for pump fittings whenever the temperature of the pumped liquid exceeds 250 F.

**Peripheral Speed Limitations**—The centrifugal stress exerted on an impeller and the resulting stretch at the impeller hub may become quite appreciable at the higher peripheral speeds used in modern high head pumps. As an example, a typical 12 in. impeller mounted on a 3 in. shaft and operating at 3600 rpm will have a stretch of approximately 0.0011 in. for bronze or cast iron. If, in addition to this, the pump handles hot water, say at 250 F, and the impeller is made of bronze, there will be an additional temperature expansion difference of 0.0014 in. resulting in a total looseness of 0.0025 in. between the shaft and the impeller. This would be excessive.

Thus, to avoid the cumulative effect of excessive thermal and centrifugal expansion, the empirical limit to the use of bronze impellers in pumps handling hot liquids is a peripheral speed of approximately 160 ft per second, or a head of 375 ft per stage.

# *Maintenance and Operation*

## It Pays to Sandblast and Resharpen Files

**Contributed by Headquarters Mfg. Engrg. Dept., Westinghouse Electric Corp.**

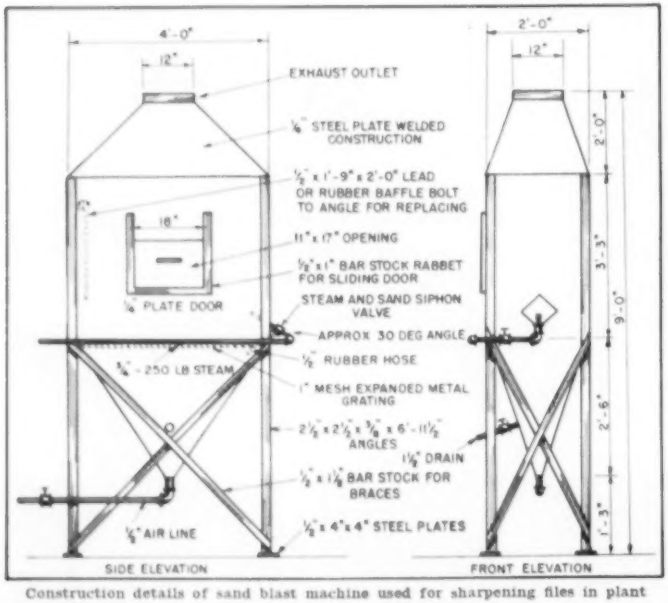
FILES RETURNED to the manufacturing for recutting cost ½ as much as new files and give equal performance. Further savings can be achieved by interim resharpening by sand blast at a cost of ⅛ to 1/5 that of a new file.

Files worn smooth, or ones that have been resharpened several times by sand blast, should be returned to the manufacturer for recutting. Tests in the Westinghouse Manufacturing Laboratories have established that these recut files are as good as new ones.

Files that have not been worn smooth can be reconditioned by sand blasting at a savings of as much as 88 per cent as compared to the cost of a new file. Depending upon the condition of the file when taken out of service, it can be sand blasted two or three times with good results. The life of a sand blasted file, before reconditioning is required, averages 85 per cent of the life of a new file.

Where activity at a plant warrants the installation, sand blasting equipment may be constructed and installed for approximately $800.

In the sand blasting operation, steam pressure of 135 to 250 lb is used with 50 grit silica sand. Since very little sand escapes from the machine during the operating cycle, the sand cost of $11 per ton is incidental. The steam is necessary in order to clean grease and dirt from the file and to cause it to dry quickly.




Construction details of sand blast machine used for sharpening files in plant

**New file cost versus recutting cost versus resharpening by sand blast**

| File Length | New File Cost | Cost to Recut | Resharpening by Sand Blast. Cost* |
|---|---|---|---|
| 6" | $ .25 | $ .13 | $ .052 |
| 8" | .31 | .16 | .065 |
| 10" | .39 | .20 | .078 |
| 12" | .48 | .24 | .093 |
| 14" | .77 | .39 | .110 |
| 16" | 1.05 | .53 | .129 |

*Including sorting, oiling and wrapping

## Building Flexibility Into Air Distribution Systems

**Contributed by E. C. Powers**
**Comp. Air & Gas Inst.**

BECAUSE OF the wide use and importance of compressed air in the modern industrial plant the distribution piping system is a matter of major concern. In the plant shown by the drawing no spot is more than 20 ft from an air connection.

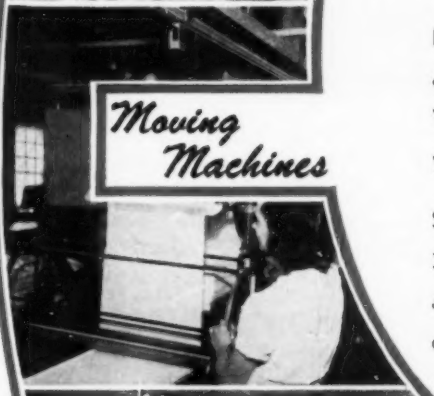
The grid, supplied at two points from a 10-in. header, consists of a 1-in. line through each bay with a ¾-in. valve as a take-off connection in each cross bay. This provided the maximum in flexibility and convenience.

Valves and connections are so

# WHAT—*no wires?*

That's about it when Electric Feedrail, the modern, totally enclosed, electrical distribution system is used.

One vertical cable connected to an overhead trolley, through an Ever-Lok trouble-proof connector—no wires to trip over, snag or tangle, no exposed circuits—and you can move the equipment along the line without disconnecting.




Feedrail is also ideal for cranes and hoists, moving test lines and lighting. In fact, anywhere electrical equipment moves. You can save wiring costs, maintenance time, speed up your plant, and make it electrically safe at the same time.

See what others are doing with Electric Feedrail. The new 32 page catalog, No. 20, with more than 100 illustrations and layouts and diagrams, and complete specification data, is yours for asking. Write for yours now.

25

ELECTRIC FEEDRAIL

**FEEDRAIL CORPORATION**

*Subsidiary of Russell & Stoll Company, Inc.*

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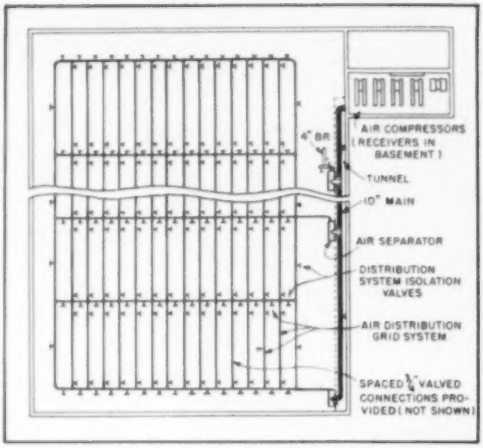
arranged that in the case of bombing, damage, or repair activities, any section can be isolated without interfering with operations in other sections of the plant.

The system is supplied at 100 psi by a battery of motor driven compressors. The five compressors range from a 1500 cfm unit to a 3400 cfm unit. Each compressor is equipped with an intercooler and aftercooler with a surge tank and filter on the air intake. Each discharges into its own receiver. An alarm system indicates when the pressure drops to 90 psi. When this happens, additional compressors can be started with a push-button control. Recording instruments measure the flow, header pressure and intake temperature. At various points in the plant reducing valves cut the pressure to 40 and 20 psi for use in test and control equipment.




In this Wright Aeronautical plant, no spot is more than 20 ft from an air connection. In case of damage any section can be isolated without interfering with air flow to other sections of the plant

## Where to Get Information on Solvents

Contributed by
Safety Research Inst., Inc.

SINCE IMPROPER handling of solvents may lead to fire or illness, it is important to be well informed about the liquids in use in the plant or shop. Information on the properties of the solvents employed and the safety of solvent-using processes may be obtained from a number of organizations and agencies.

The manufacturers are interested in preventing solvent accidents, and are therefore a major source of information on the properties and correct handling procedures for the chemicals they produce. In many cases, the solvent distributor can supply the information, or can direct questions to the manufacturer.

***The Manufacturing Chemists' Association,*** to which solvent manufacturers belong, publishes detailed Safety Data Sheets on a great many products and these may be purchased from its Washington, D.C., office.

***The National Safety Council,*** which has its headquarters in Chicago, is another organization which publishes data sheets on the safe use of various solvents.

***The National Fire Protection Association,*** in Boston, Mass., publishes standards and other literature on the handling of flammable solvents.

There are also various governmental industrial hygiene agencies which can supply information on solvents and solvent processes. In addition, these agencies can supply various services, such as a check of the solvent process, a survey of ventilating equipment, examination of employees for symptoms of solvent exposure, and assistance in planning a safety program. In general, these services are available without charge.

State agencies also publish literature and render the services described through State Bureaus of Industrial Hygiene. These are located in the State Department of Health, except in Massachusetts and New York, where they are part of the Labor Department. A number of cities have municipal hygiene departments which can render assistance.

## Place V-Belts On Sheaves Correctly

ON A PARTIALLY belted V-belt sheave it is best to place the V-belts as close to the bearing as possible. By so doing, less bearing pressure will result because of the smaller leverage of the belts. In any belt drive, the greater the distance of the "center of belt pull" from the center of the bearing the greater will

## Estimating Bar and Shaft Weights and Volumes

A SIN OF OMISSION occurred in the November issue of this magazine. The listing of materials represented by the letters, A, B, C, etc. on the chart below did not appear and consequently, the chart was useless. They are reproduced below and the cut appears once more. It is smaller this time, but reference, if necessary, can be made to the original cut which appeared on page 40, November issue of Plant Engineering. Our thanks to all the readers who wrote requesting copies of the listing. There are many, many 20/20 visions among PE fans.

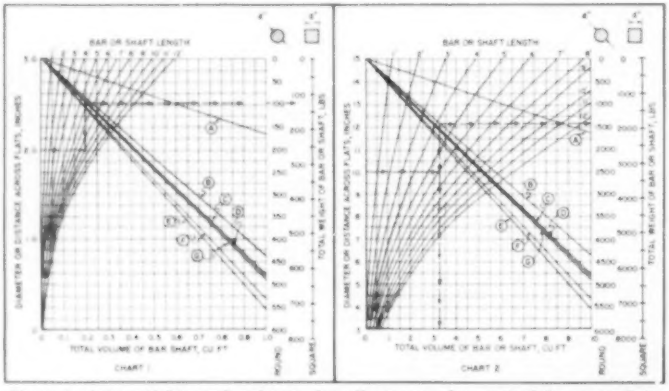
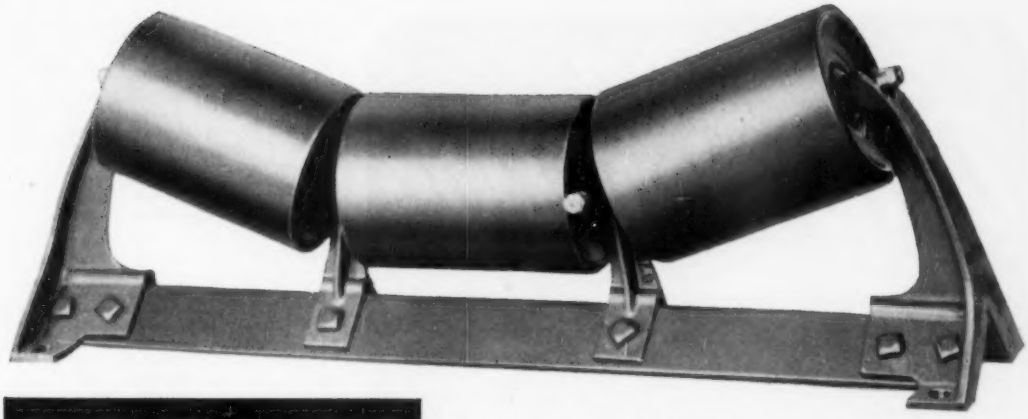



Chart 1 gives weights and volumes for all common bar materials up to 3 in. diameter. Chart 2 covers all diameters from 3 in. to 15 in. Reference letters mean: A—Cast Aluminum; B—Cold Rolled Zinc; C—Aluminum and Bronze; D—Wrought Iron; E—Cast Rolled Copper, Rolled Monel Metal, and Phosphor Bronze; F—Cast Rolled Brass; G—Cold Drawn Steel



# GIVE IT A RIDE— ON JEFFREY BELT IDLERS

Costs must be cut. No question about that . . . and no question about the economy of Jeffrey Belt Conveyors when small or large quantities of material must be handled. We can furnish them by the rod, or mile, just as the job requires. We know how to provide for reliability under tough conditions, handling of peak loads, low investment, high salvage and other things which are problems peculiar to engineering.

Hence, we say, "Give That Material A Ride on Jeffrey Idlers." They are the backbone of the belt conveyor . . . have been the choice of smart operators on thousands of jobs. They are built to take day-after-day punishment . . . have that reserve strength and durability that count for many years of satisfactory, efficient trouble-free service.

Whether yardage looms large in the estimate, or small capacity is desired, Jeffrey engineers are skilled in the application of material handling to most any job. We would like to talk things over—constructively.

*Catalog No. 785 Tells All*

**Self-aligning, Troughing-type Belt Idler**

Pivotly mounted on a supporting cross member, guide rollers are mounted on arms and extend at right angles to idler. Need only to be spaced about 20 to 50 feet apart to keep belt in perfect alignment. Will not damage belt.

**Pivoted-type Return Idler**

Used for both troughing and flat belt conveyors. Of the self-aligning, two-pulley type. Also standard return rolls pivotly mounted in ball bearings on supporting cross member. Write for full details about Jeffrey Idlers for either troughing or flat belt service.

# THE JEFFREY MANUFACTURING COMPANY

Established 1877

905 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

| | | | | |
|---|---|---|---|---|
| Baltimore 2 | Chicago 1 | Detroit 13 | Jacksonville 2 | Pittsburgh 22 |
| Birmingham 3 | Cincinnati 2 | Harlan | Milwaukee 2 | St. Louis 1 |
| Boston 16 | Cleveland 13 | Houston 5 | New York 7 | Salt Lake City 1 |
| Buffalo 2 | Denver 2 | Huntington 19 | Philadelphia 3 | Scranton 3 |

*Jeffrey Mfg. Co., Ltd., Head Office & Works: Montreal*

Here's Why

# Darts Don't Drip

**SPHERICAL GRINDING** forms the seats of a Dart union into a true ball joint. Bearing surfaces are wide, precision-matched to lock the leaks without excessive wrenching.

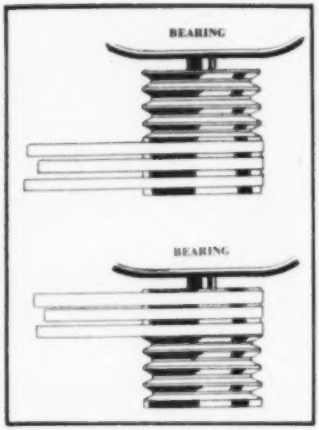
**TWO BRONZE SEATS** are non-corroding . . . designed to last for years without a leak.

**RUGGED CONSTRUCTION** of practically indestructible high-quality, air-refined malleable iron shrugs off tough service and brutal wrenching.

DARTS mean satisfied customers . . . better profits for you.

**DART UNIONS**

**E. M. DART MFG. CO.**
**Providence 5, Rhode Island**




Arrangement at bottom results in lower bearing pressures

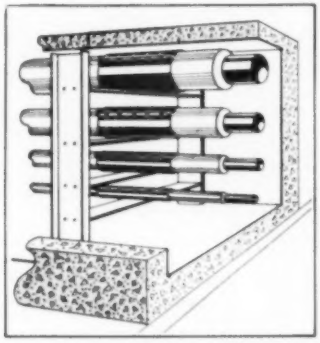
be the pressure of the shaft against the bearing and consequently, the greater will be the friction and loss of efficiency.

## Insulation of Pipe Supports Reduces Heat Losses

**Contributed by**
**The Magnesia Insulation Mfrs. Assn.**

TO PREVENT excessive heat losses due to direct metal-to-metal contact between hot pipe surfaces and structural supports, insulated supports may be used. In this type of installation, developed by Sargent & Lundy, from test work done at the University of Illinois, the length of piping is insulated and then supported on the insulation by hangers or channel irons.

Where the piping is to be supported by a hanger, a 10-gauge steel plate, its length proportioned to the load to be carried, is rolled into a band to fit the insulated pipe and provided with a flange for assembly.



Principle of the insulated pipe support as installed in underground conduit at the University of Illinois

A saddle plate, ⅜ in. thick, is then tack welded around the lower half of the flanged band, to assist in carrying the direct load and in spreading it over a wide area. The unit is then bolted in place around the insulated pipe, a filler bar is fitted over the upper half of the flanged band, and the usual hanger strap is fastened around the entire assembly.

Where the pipe line is to be supported by channel irons, a 16-gauge sheet metal band, 18 in. long and flanged for assembly, is bolted around the pipe at each point of support.

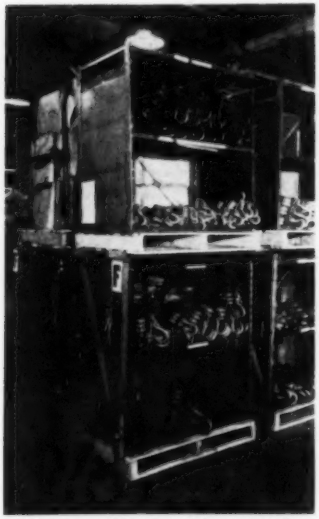
## Pallet Inserts Facilitate Storage, Moving

**Contributed by Unistrut Products Co.**

HIBBARD-SPENCER-BARTLETT & Co., Evanston, Illinois, long on materials handling know-how, have come up with a noteworthy pallet rack application in the double shelf insert shown in the photograph.

Mounted on a standard wood pallet, the insert is simply a 2-shelf shell with a coarse mesh wire screen fastened across the back. The screen provides easy identification of contents from the back, and costs less to use than sheet steel. Bracing is accomplished with two strips of hanger iron which cross and tie at the back.

These inserts double the facilities for storing hardware items of limited quantity and size, and can be quickly moved by fork lift truck to any other location as requirements dictate. They were designed for use with adjustable and reusable pallet racks, 3-½ miles of which are in use by Hibbard in its huge warehouse.



**Hard-to-store items, which are held in limited quantities, may be stored more easily and quickly transported by fork truck to point of use**

**Are your trucks "Chained Down?"**

**CHAIN DRIVE SPELLS TRUCK FAILURE . . .**

***that's why Stuebing engineered true differential drive into HydroLectric K Lift Trucks.***

● Check maintenance records on your truck fleets. You'll find drive failures account for the greatest percentage of repair costs and down time. Old-style chain drives just can't take it!

True differential gear drive, the same as in your auto, eliminates chains in the Hydro*Lectric* K . . . outwears chain drives ten to one according to fleet owner reports. All gears and running parts are sealed in lubricant for longer life.

*Only Stuebing engineered trucks give you this sealed gear drive . . . plus four-wheel stability, easy steering, twin front driving wheels.*

**Get the dollars and cents facts before buying your next truck. For full details on comparative costs and job records write Stuebing at Lift Truck Headquarters for Bulletin S.**

**LIFT TRUCKS INCORPORATED**

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**Pioneers and Leaders in INDUSTRIAL DUST CONTROL**

Sly "Unit" Dust Filter Up to 6,000 cubic feet of air per minute

Sly "Economy" Dust Filter Up to 1,400 cubic feet of air per minute

**USED FOR DUST EXHAUST FROM INDIVIDUAL MACHINES OR GROUPS OF SMALL MACHINES**

Hundreds of these Sly Dust Filters collect all the dust from grinding, screening, mixing, packaging, and finishing operations. Greater filter cloth area assures greater collecting efficiency and longer life.

For special purposes, these filters can be built of stainless steel, galvanized iron, aluminum or nickel.

Sly Dust Filters are also available with unlimited capacity for larger installations.

Write us about your dust problem.

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# New Products and Methods

**WHAT'S NEW?** On these pages the Editors summarize the outstanding industrial developments of leading manufacturers who will supply you, free of charge, the bulletins or other information desired. For ease in making requests use the no-obligation, postage-paid card, pages 25 and 59

## 1—AUTOMOBILE LOADER

**Is engineered for fast transfer of autos into freight cars**

The Autow Loader is built for handling completed autos and with it two men can load six rail cars in a day, company reports, adding that it usually takes five men to load three cars with the usual hand tools. By means of an automatic hydraulic jack coupled to the front of company's tractor tug it is said to be possible to move even the largest cars rapidly into position in the rail car.

This jack, coupled to the front of the tractor tug with a toggle ball joint, is raised hydraulically by a foot lever operated from the platform of the tractor tug. It is lowered by a hand lever.

In the loading operation, six rail cars are spotted on a spur track on each side of the loading dock. The passenger cars are then driven onto the dock. Both 40- and 50-ft rail cars may be used. In loading, the operator runs the jack under the differential housing of the auto, jacks it up and moves forward. Another operator, walking beside or seated inside the automobile, steers the front end into the rail car while the Autow Loader operator pivots the rear of the auto around and moves it inside the rail car. Salsbury Corp.

## 2—ANGLE HEAD WRENCHES

**Of alloy high-carbon steel, are designed for close-quarter work**

The heads of these wrenches are set at angles of 30 and 60 deg to the handle. As both heads are same size, switching ends permits turning nuts in narrow swing areas. Thin heads also minimize clearance problem.

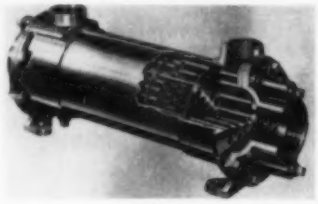
Other features include rounded handle edges, pear shaped heads, draw-broaching for clean-out close fitting wrench openings, and a double-plated rust-proof finish of nickel and chrome. Four wrench sizes are available with 7/16, 1/2, 9/16 and 5/8 in. openings. Snap-On Tools Corp.

## 3—HEAT EXCHANGER

**Is standardized unit, of Type 316 stainless steel**

Immediate delivery and low unit cost of this all-stainless steel heat exchanger are possible, states manufacturer, because of complete standardization and stocking of all component parts. Identical in design and capacities to company's all-copper and copper alloy units, the new Type SSCF model utilizes stainless to avoid contamination of fluids or corrosion by fluids.

Exchanger comes in complete range of sizes tested to 450 psi to withstand strenuous usage. While Type 316 is standard because of its widespread acceptance in industry, SSCF exchangers may be ordered in other types of stainless steel. Ross Heater & Mfg. Co., Inc.



## 4—FLUORESCENT SUN LAMP

**For industrial applications requiring a cool, uniform mid-violet**

In 20 or 40 w sizes this sun lamp has same dimensions and electrical operating characteristics as standard fluorescent lamps but is designed to radiate over a large area with output concentrated in mid-ultra-violet wavelengths. It is described as efficient, long lasting and economical. Suggested retail prices are $4.50 and $7.00 and power consumption is reported to be low. Lamp is said to start and re-start without warm-up period.

According to company, this lamp produces a soft blue light of low visibility, cool enough to touch. It can be used to provide a quick or gradual suntan for a roomful of people, it is reported, and its mid-violet radiations are a close duplication of the ultra-violet in sunshine. Westinghouse Electric Corp.

## 5—CABLE STRIPPER

**For stripping sheath from lead, armored, rubber or plastic cable**

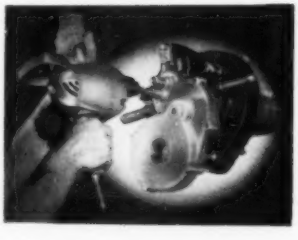
The yoke and roller swivel arrangement of this cable permits either circumferential or straight cuts to be made at any predetermined point on the cable, according to manufacturer, and the entire operation is done with one hand.

Section of sheath from center of cable or at the ends for terminals are safely and easily removed without injury to the wires, it is stated. The stripper is made in several models for use with various kinds of cable. Their weight is approximately 7 oz. for the small size to 10 oz for the larger size. They are precision built to provide for long life and trouble free operation. Taca Co.

## 6—PIPE THREADER

**Is portable electric machine for handling up to 6-in. pipe**

The Porta-Drive is designed to fit in the average tool box, and weighs only 14 lb. One man operating it can thread up to 6-in. pipe in any position, it is reported. Actually a 20 to 1 gear reduction unit,



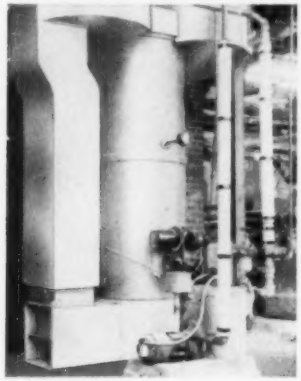
Porta-Drive is driven by any ½ hp, heavy-duty electric drill and attaches to any standard set of dies by adaptor-yokes. An aluminum casing houses a bull gear and cold rolled spur gears, all sealed in grease.

Porta-Drive threads pipe in close quarters such as excavations, corners and near walls. It is not necessary to remove broken pipe when threading it with Porta-Drive. After threading is completed, insertion of the drill head into a "reverse" drive socket allows removal of the die. Muncie Gear Works, Inc.

## 7—PROCESS HEAT UNIT

**For drying materials requiring temperatures up to 500 F**

Primary unit of the new model Thermobloc is a gas or oil fired heater 300,000 or 550,000 Btu per hr, using forced air circulation.



Model is designed to re-circulate its air until the desired temperature is reached, and then discharge continuously at the temperature required. It is recommended for drying towers, spray booths, drying rooms. Prat-Daniel Corp.

## 8—THAWING CHEMICAL

**In small pellet form, for sprinkling over snow and ice surfaces**

Melt is said to be 99 per cent active, and the thawing capacity of 1 lb of it equal to that of 12 lb of salt. It is described as having great covering capacity and if used at the start of a snow or sleet storm, will melt subsequent snow falls.

It is recommended for use on driveways, sidewalks, loading platforms and steps, and for thawing frozen gutters, pipes, sewers and railway switches. There is no messy residue, it is reported. Comes in 25, 100 and 200 lb fiber drums, also in ton lots packed in 100 lb moisture proof paper packs. The Chem Industrial Co.

## 9—FLOODLIGHTS

**Heavy duty, for general lighting or floodlighting service**

The Type L-84 rated at 500 w and the Type L-85, 1000 w, come in a complete range of NEMA types 1 through 5. Weather-tight and constructed of heavy-gauge aluminum, each of the units weighs less than 17 lb. Non-corrosive materials—aluminum and stainless steel—are used throughout.

The door, hinged for easy relamping, uses three simple swing-type door latches. The heat-resistant door glass is cushioned in a silicone rubber gasket which also seals joint between door and the casing. A clamping handle for vertical adjustments is provided so floodlights can be serviced without tools.

An auxiliary reflector of finished aluminum provides high beam efficiency. The floodlights can be provided with either narrow-beam polished or wide-beam etched reflectors. Both the L-84 and the L-85 are available in three standard mountings, including a portable base. Lighting and Rectifier Divs., General Electric Co.

## 10—LADDER TREADS

**Provide standing comfort when attached to extension ladders**

Intended for use by painters, maintenance men and others who work on ladders for long periods of time, E-Z Treads were designed for easier standing and less foot fatigue. Engineered to fit any standard

***Users report wide range of production machine repair jobs where worn parts are put back in service fast, reducing "down" time to minimum.***

**Motors, For Instance—**

When motors must be taken off the line because of shaft wear, it's up to the maintenance man to get them back in service as soon as possible.

With metallizing there's no need to remove the armature shaft from the winding. You just set the shaft in the lathe, winding and all, take a rough cleaning cut on the worn areas, metallize a preparation coat of Sprabond, (the new self-bonding metallizing wire) and complete build-up by spraying with carbon steel. Then finish and that's all there is to it.

**Some Typical Motor Repair Times—**

One shop reports the following motor repair jobs and time involved with metallizing—

| Motor Hp. | Journal Dia. | Worn Length (Approx.) | Total Repair Time* |
|---|---|---|---|
| 1 | ⅝" | 2" | 19 min. |
| 5 | 1¼" | 3¼" | 37 min. |
| 10-15 | 1⅜" | 4½" | 53 min. |
| 30 | 2¼" | 5⅜" | 1 hr. 14 min. |
| 60-75 | 2¾" | 7" | 1 hr. 43 min. |

*Includes preparation, metallizing build-up and finishing, both journals. Metallizing wire used was .10 carbon steel. Finishing by No. 883 Carboloy bits. Total repair cost, including material, averages less than one-tenth of replacement cost.

**Other Fast Repair Jobs**

A list of typical, every-day repair jobs done at high speed with metallizing would fill a book. On pumps, for instance, the time required for rebuilding a rod of average size (1½" x 4' lg.) with stainless, including preparation, metallizing and finishing, is well under three hours. Rebuilding a worn bronze packing sleeve, 4" dia. x 6" lg., with stainless for longer wear and better corrosion resistance, takes about 1¼ hours. Material costs are usually figured in pennies.

And so it goes—shafts of all kinds, spindles, journals, rolls, fits, and many other jobs. Just check over this partial list of every-day metallizing applications from every type of industry:

| | |
|---|---|
| Bearing Fits | Patterns |
| Camshafts | Pistons and Rods |
| Crankshafts | Plug Cocks |
| Cylinder Liners | Plungers |
| Gear Fits | Power Rods |
| Hydraulic Rams | Pulleys |
| Impellers | Pump Plungers |
| Journals | Roll Journals |
| Lathe Beds | Rolls |
| Mandrels | Shafts (all kinds) |
| Packing Glands | Spindles |

***On All, You Avoid Costly Shutdowns —Save Time and Money***

We've prepared a series of Bulletins, each of which goes into detail on some special type of metallizing repair job. Just check off the ones you would like on the coupon below and mail to us—we'll be happy to send copies.

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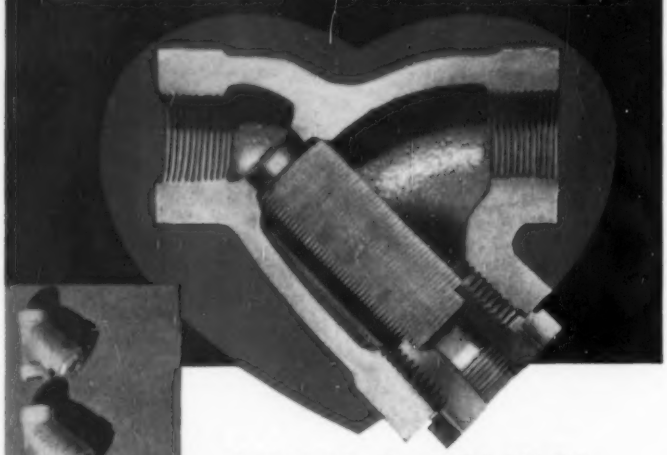
# The SCREEN of the YARWAY STRAINER



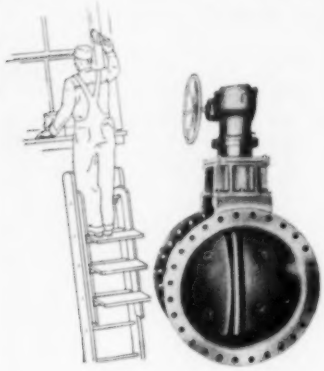
MAKES PIPELINES *Lifelines*

- The heart of a strainer is its screen . . . and the screen in Yarway Strainers keeps pipelines open . . . prevents rust, scale and dirt from clogging equipment.
- *Screens* are of high-grade monel woven wire, fine enough for required straining service, yet having ample free area for passage of clean condensate, light oil or other fluids. Perforated screens if desired.
- *Screencap* is made with straight thread, machined face and spark-plug-type gasket for attachment to body. Permits easy removal for cleaning. Insures proper alignment of screen when it is replaced in body.
- *Body* of Yarway Strainer is iron or steel, cadmium-plated for protection against corrosion and for better appearance.
- Available in six sizes, ½" to 2", for pressures to 600 lbs. Stocked and sold by 150 Mill Supply Houses. Reasonably priced.
- Hundreds of thousands in use. See your nearest dealer, or write for Bulletin S-201.

YARNALL-WARING COMPANY
145 MERMAID AVENUE PHILADELPHIA 18, PA.

YARWAY STRAINERS
"Police the Pipelines"


extension ladder, the unit consists of three wooden treads 12 in. apart, supported by full-width iron bracket supports riveted to steel hangers. Treads are set at position intended for to afford good balance and will support 600 lb. Depth of tread-plus air-gap plus rung provides a standing surface ample for practically any foot. Put together with six bolts, E-Z Treads are light weight and can be carried in the car trunk. Price $6.95. J. E. McKinley Co.



## 11—RUBBER LINED VALVE

**Has 125-lb flanges and renewable one-piece rubber seat for shut-off**

Type No. 709 is a 30-in. 50-lb valve described as air bubble tight at 80 psi and drip tight with water at 100 psi. It may be used efficiently in temperature range from 20 F to 200 F, manufacturer states, adding that because the valve shaft moves only with an oscillating motion special handwheel control has a fully enclosed gear reduction drive. Adaptable to automatic control. Valve is available in smaller or larger sizes, in all materials, and for higher pressures. R-S Products Corp.

## 12—METAL DEGREASER

**For cleaning motor blocks, pistons, clutches, other parts**

This unit cleans by flooding the parts with an inexpensive chemical detergent. It is said to wash metal free of accumulated dirt, grease and grime. With it, cleaning time is greatly reduced, manufacturer declares, adding that this degreaser involves no fire hazard. It is equipped with casters and may be moved where needed.

About 70 gal of chemical are required, but because of recirculation of the fluid a single filling is expected to last for months. Dirt and grease removed from parts settles to bottom of tanks and may be flushed out by pumping detergent into a receptacle, flushing tanks with water, and returning detergent to tanks. Wilkinson Mfg. Co.

## 13—VARIABLE SPEED UNIT

**Is extra small transmission for instruments, light machinery**

Intended for use in instruments, recorders, timers, small mixers and light conveyors, the midget Model 10 is said to deliver all

*(Continued on page 61)*

# Bulletins on Current Plant Problems

(Continued from page 34)

covering its use on boiler shells, settings and drum heads, hot storage tanks, driers, feed water heaters, ducts, joints and piping. Also discusses mineral wool in detail, listing available sizes and describing and illustrating various forms. Includes heat loss estimate sheet and instructions for using it. Industrial Mineral Wool Institute.

## FLOORS
## FLOOR MAINTENANCE

**138 Heavy-Duty Flooring**—Form MF-4a, 36 pp, gives full information on a product and method for a wide range of industrial flooring applications. Field experience and laboratory tests are presented to show that this trowel-on concrete flooring wears exceptionally long, is spark resistant, static dissipating, non-dusting, corrosion resistant, easily cleaned and economical. Other advantages are discussed, including optional non-slip finish. Full-color chips illustrate range of colors. Job pictures show some of these in service and detailed instructions for laying floors in new construction and for resurfacing old floors are included. The Master Builders Co.

**139 Floor Compound**—Plenty of practical information on industrial floor safety is packed in pocket-size Form A385. Presents merits of company's compound for absorbing oil, grease and liquids, gives prices and coverage, and discusses its safety and light reflection advantages. The Eagle-Picher Sales Co.

**140 Floor Cleaning**—Although this 4-pp bulletin features company's heavy duty floor maintenance machine it also describes and illustrates the machine's quick-change attachments. In telling their applications it gives some excellent pointers on the cleaning of all types of floors. A cutaway drawing of the machine is used to illustrate the inside story of its performance. S. C. Johnson & Son, Inc.

## FIRE PREVENTION, SAFETY

**141 Fire Retardant Treatment**—Generously illustrated with photographs, Form G-26 discusses company's chromated zinc chloride treatment for affording fire retardance to wood, telling of its applications in industrial construction and including specifications for pressure treatment of building lumber. A series of pictures shows effect of a kerosene fire on treated and untreated wood. Wood Preserving Div., Koppers Co., Inc.

**142 In Case of Fire**—This two-color chart is worth its size in wall space and deserves to be studied at leisure; but it's clear enough to be helpful in an emergency because it shows exactly which extinguisher to use and how to use it. Illustrates company's $CO_2$, dry chemical, foam, water, and vaporizing liquid extinguishers and, in tabular form, gives their applications, method of operation, extinguishing effect, capacities, and maintenance. Class A, B and C fires are defined and the effectiveness or limitations of each type of extinguisher on each class of fire can be noted. Walter Kidde & Co., Inc.

**143 Eye Safety Program**—This 16-pp booklet, titled, "How to Set Up and Conduct a Safety EE Program," contains information useful to any concern planning to establish or expand a program of eye safety through the use of prescription safety goggles. Includes suggestions on how to obtain necessary professional services and step-by-step instructions on the use of company's new order book supplied to industrial plants. American Optical Co.

## HEATERS, HEATING

**144 Industrial Heating Unit**—This bulletin presents advantages of company's gas or oil-fired self-contained heating unit, explaining its operation, simplicity of installation, and describing and illustrating some of its applications. Includes specifications. Also contains engineering data to help analyze industrial heating problems, including procedures to determine heat load, fuel consumption. Thermotube Div., Frost-Daniel Corp.

**145 Space Heaters**—The advantages of using company's warm air space heaters in the tempering of make-up air are fully explained and illustrated in Bulletin 220, which also discusses other applications of these heaters. Several installations are pictured and a typical example of providing tempered make-up air in a large foundry is provided. Dravo Corp.

**146 Furnace Heat Control**—Bulletin SC-2.1 is devoted to company's combustion controller, a device for mixing common gas and air and raising the mixture to pressures sufficiently high and constant to develop uniformly fast combustion rates. Discusses uses of the device, its physical and chemical control over combustion reactions, design and construction, and selection procedure. Includes capacity tables for both positive and centrifugal type controllers, photos of several installations. Selas Corp. of America.

**147 Deaerating Heaters**—Bulletin W-101 outlines the principles of deaeration, fully describes the design, operation and applications of company's deaerating heaters, and explains their distinctive features. Both vertical and horizontal types are pictured, and the illustrations also include flow sheets for this type of apparatus in conjunction with other feedwater equipment in intermediate pressure, high pressure, and central station boiler plants. Graver Water Conditioning Co.

**148 Heat Processing Machines**—Shallow gas heating rates of from 1 to 5 min per thickness inch of steel and the consequent metallurgical advantages of faster metal flow and reduced scale formation are discussed in 4-pp Bulletin S-6.1 titled, "Heat Processing Machines for Forging and Bending." Longer die life, product uniformity, operator comfort, labor and fuel economies are included among the subjects covered. Illustrated by photos, charts and diagram, the bulletin stresses faster production rates and reductions in costs as results of the use of automatic heating machines. Selas Corp. of America.

## FUEL BURNERS, VAPORIZERS

**149 Gas Burners**—Engineering data, dimensions and full specifications on industrial gas burners designed to burn natural or mixed gases are provided in illustrated L. P. Form 1618A, 4 pp. Adaptability of these burners for a quick changeover from gas to oil firing and their use with an underfeed stoker are described. Iron Fireman Mfg. Co.

**150 Fuel Vaporizer**—This bulletin describes company's completely redesigned fuel vaporizer to power gas engines. It provides full operational data on this vapor source; explains process by which the vaporizer strips volatile fractions from pipeline or lease crude and makes them directly available to the engine carburetor; gives basic crude requirements. Illustrations include a detailed flow diagram and dimensional sketch of the 40 hp fuel vaporizer. Specifications and capacity tables cover the 20, 40, 110 and 300 hp units. Black, Sivalls and Bryson, Inc.

## LIGHTING

**151 Planned Lighting Guide**—This is a selection guide for planned lighting equipment. It features a handy chart which enables reader to see at a glance the application of each of company's 12 major lighting systems, covering practically every seeing task with illumination requirements from 10 to 150 ft-c. A separate chart shows application of special lighting units for use in locations with combustible, dusty or damp atmospheres. Includes buyer's guide showing what to look for when appraising lighting equipment and a check list of benefits derived through proper application of planned lighting to industrial operations. Benjamin Electric Mfg. Co.

**152 Lighting Fixtures**—Catalog 640 illustrates and describes company's accent lights, rotating beam lights, recessed adjustable units and other types, also general ceiling louvers. Contains full ordering information and provides application and installation suggestions. Current price list included. General Lighting Co.

## INSTRUMENTS AND CONTROLS

**153 Temperature Indicators**—Resistance thermometers for temperatures up to 300 F, thermocouple thermometers for temperatures up to 2000 F, and accessories are described and illustrated in Bulletin GEC 885. Discusses the industrial applications of these indicators, explains their operation and gives specifications. Includes prices, other ordering information. Apparatus Dept., General Electric Co.

**154 Flow Meter**—Publication 19979, introduces a variable-area meter designed to provide an economical and accurate means of measuring gas flow rate. Illustrates meter and mounting arrangement, explains design and includes capacity and dimension tables. Fischer & Porter Co.

**155 Wide Range Megohmer**—Bulletin 1020, introduces an instrument designed for precise measurement of electrical re-

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distances over a range 200,000 ohms to 20 million megohms in six decades. Describes and illustrates the instrument. Explains its operation, discusses its accuracy, and gives specifications. Herman H. Sticht Co.

**156** **Engineered Machine Computations**—This booklet describes the engineering-computing service, "Telecomputing," and the specialized equipment developed for it. Booklet presents company's history and its engineering staff, machines' service procedure and applications and the development and manufacture of automatic graph readers, electronic graph recorders and novel vibration frequency pick-up. Telecomputing Corp.

## MECHANICAL POWER TRANSMISSION

**157** **Speed Control**—Company's variable driven, pulleys and transmissions are featured in Bulletin 410. Filled with photos of machinery on which these have been installed, it shows their use on grinders, lathes, drill presses and other machines. Each application is described briefly and several examples of increased production resulting from this equipment are cited. Reeves Pulley Co.

**158** **Fluid Drives Manual**—Book 2388, 32 pp., presents company's electric fluid drive, electric fluid gearmotor, fluid drive, fluid gear drive and fluid coupling drive. Generously illustrated with photographs of equipment and installations it contains necessary engineering data, discusses applications and advantages—presenting case-history evidence of increased efficiency and reduced maintenance. A section covering electric fluid drive lists equipment on which this packaged power unit can be applied. Link-Belt Co.

## METALS, METAL PARTS

**159** **Graphitar Data Book**—Catalog G-49 provides 68 pp of information on a carbon-graphite material, Graphitar, including physical properties, characteristics chemical resistance, manufacturing limitations, operating data, assembly methods and charts and 60 typical applications. Fully illustrated in 2-color sketches and photos, the information in this book is well presented. One interesting section is devoted to "do's and don'ts" in the design of parts to be made of Graphitar. The United States Graphite Co. Div., The Wickes Corp.

**160** **Powder Metallurgy**—This attractive 36-pp booklet contains neither sales message nor ordering data, just interesting information on present-day powder metallurgy. Illustrated with sketches, it tells how things are made from metal powder and describes and pictures some common objects now made from metal powder, telling the advantages of this process. Also touches upon the special applications which accomplish results not possible except by powder metallurgy. Discusses the mechanical characteristics and design of powder metal, gives the history of the process, and comments on its future. Also lists more than 100 objects now being made of powder metal. F. J. Stokes Machine Co.

**161** **Bearings and Castings**—Illustrated with pictures and charts, this 36-pp booklet gives physical properties and comparative specifications for 27 different bronze alloys and five aluminum and manganese bronzes. It contains an outline of the many applications of bronze. Sizes and weights of rough and machined "Tiger" bronze bars are tabulated. Babbitt metals, their descriptions and uses, are also discussed and illustrated and their physical properties charted. Booklet also describes company's facilities for manufacture of non-ferrous bearings and castings. National Bearing Div., American Brake Shoe Co.

**162** **Abrasive Resistant Alloy**—Illustrated Bulletin T-176, on reducing abrasive wear, describes the physical properties of Therm-alloy HC-250, listing the uses and advantages of this abrasive resistant material. Physical properties of the alloy are compared with those of other metals in tabular form. Bulletin also provides case histories of the metal giving actual field service data. Information is included on machining and high temperature service. American Brake Shoe Co.

## TOOLS, MACHINERY MAINTENANCE

**163** **Electric Blowers**—Illustrated Bulletin 378 covers portable electric blowers in 1/3 to 1-1/3 hp sizes for removing dust, dirt, grit and grindings from motors, bearings, shafting and gears. Emphasizes economy of blowers in cutting production costs, saving power and reducing breakdown of machinery and equipment and repair jobs. Other advantages of the blowers and their operation are covered in text. Attachments for use with blowers which make them applicable for industrial vacuum cleaning jobs are also described and illustrated. Breuer Electric Mfg. Co.

**164** **Torches, Soldering Products**—Manufacturer's complete line of soldering products is covered in 24-pp Catalog 58. These include gasoline and kerosene blow torches, self generating alcohol blow torches, electric soldering irons, solder, splicer's furnace, paraffin supplies and compound kettles. Also described are ovens, grease buckets, shop torches, and steel gauge and shells. Equipment is illustrated by photos and sizes, prices listed. P. Weil Mfg. Co.

**165** **Tooling Guide**—A tooling guide as well as listing of tools, Catalog 17 presents complete ordering data, including prices, on most of company's line of mills, deburring and tubing cutters, reamers, countersinks, ball nose drills, hand files and rasps and other finishing tools. Also contains necessary technical information on the tools and helpful suggestions on their use and application. Clearly illustrated with photos and sketches. Severance Tool Industries, Inc.

**166** **Drill Size Chart**—This is a concise, pocket-sized chart for quick reference use. Shows concrete drill sizes in relation to pipe, conduit and anchors. Tilden Tool Mfg. Co.

**167** **Ring Wrench Handbook** — Pocket-size Circular 979 features two types of steel wrenches, one with knurled collar and the other of one-piece construction, also a bronze retaining ring. Wrenches and their method of application are described and illustrated. Prices quoted. The Lamb-henheimer Co.

**168** **Disc Wheel**—The special advantages of company's bonded disc wheel, for use on electric rotary sanders, angle head flexible shafts and air tools, are explained in Form 4901A, a pocket-sized folder. Photo shows disc in use. Abrasive Wheel Dept., Raybestos-Manhattan, Inc.

## LUBRICATING

**169** **Lubricant Application Guide**—Included in 36-pp Form C10L, covering company's lubricants, are tested recommendations for lubricating all types of bearings under various operating conditions. Other information covers lubrication of power generating, transmission and materials handling equipment, also special recommendations on the lubrication of pump glands, valves and other equipment subject to contact with acids, alkalis and moisture. A highly useful book. It's illustrated and indexed and arranged for easy reference. Contains lists of suppliers according to cities. Keystone Lubricating Co.

**170** **Automatic Lubricating Equipment**—Four-pp Broadside 4900-OS is a condensed catalog of manufacturer's lubricating devices, describing and illustrating constant level, gravity feed, wick feed, thermal, bottle, underfeed oilers, cup and gage combinations and other types. Contains application suggestions on how the waste and guesswork of "trust to luck" oiling can be eliminated, production increased and machine life extended. Trico Fuse Mfg. Co.

## MISCELLANEOUS

**171** **Pressure Vessel Accessories**—Engineering data and specifications on company's line of pressure vessel accessories are given in 64-pp Catalog 0-52, which is sectionized for easy reference. Welding necks, manways, nozzles, covers, rings, studding outlets, saddles, fittings and other press formed specialties are presented with dimensional data, pressure ratings, code specifications, construction details and service recommendations. Photos and blueprint style illustrations of products are included as are installation and application illustrations. Also included is a handbook reference section of technical information. Lenape Hydraulic Pressing & Forging Co.

**172** **Weed Killer**—This 24-pp booklet covers hormone type herbicidal compounds of 2,4-D for absorption by foliage and killing the entire plant. Gives chemical and physical characteristics of 2,4-D in its acid, sodium salt, and isopropyl ester forms, discussing their liquid formulations, oil base preparations and solid formulations and dusts. Includes solubility guide. Monsanto Chemical Co.

**173** **Chemical Reference Data**—Here is a convenient set of reference file folders available to plant engineers concerned with metals cleaning and other work involving industrial chemicals. Printed in colors on firm stock, the folders facilitate filing of technical information under four headings: paint removal, phosphate coatings, metal cleaning, and spray booth maintenance. The cover of each folder provides brief descriptions of company's line of compounds and chemicals along with technical advisory service furnished. Klean Chemicals, Inc.

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(Continued from page 58)

speeds from top to zero with great accuracy of speed holding and reset over the entire range.

It is available with lever type of control for connecting, through suitable linkage, to mechanical, hydraulic, electric or pneumatic control devices. Transmission may also be had with micrometer type of control for fine adjustment.

The Model 10, without reduction, when driven at 2700 rpm, delivers speeds from 1800 rpm to zero, or at 1800 rpm input gives speeds from 1200 rpm to zero with torque of 50 in-oz. Built in reduction gear boxes with ratios from 5:1 to 1000:1 are available, manufacturer points out, and make a compact package of speed drive and gear reducer in a single unit. Transmission is self-lubricated, with oil level and oil drain plugs. Sealed bearings permit mounting in any position. Price $29.75. Graham Transmissions Inc.

## 14—METAL CUT-OFF

### Is low cost general purpose machine powered by 5 hp motor

Positive drive, flexibility and ease of operation, self-centering vise adaptable to most contours and shapes, and operator's safety are features emphasized for this "swing-cut" abrasive metal cut-off machine. With it, cuts up to 3 in. solids and 4 in. pipe in both ferrous and non-ferrous materials can be made, company states.

Rigid construction plus positive holding are said to increase wheel life and permit straight cuts to close tolerances with a minimum of burr. And cutting at high speeds is said to reduce the possibility of burn in metal and eliminate need for wet cutting in many materials.

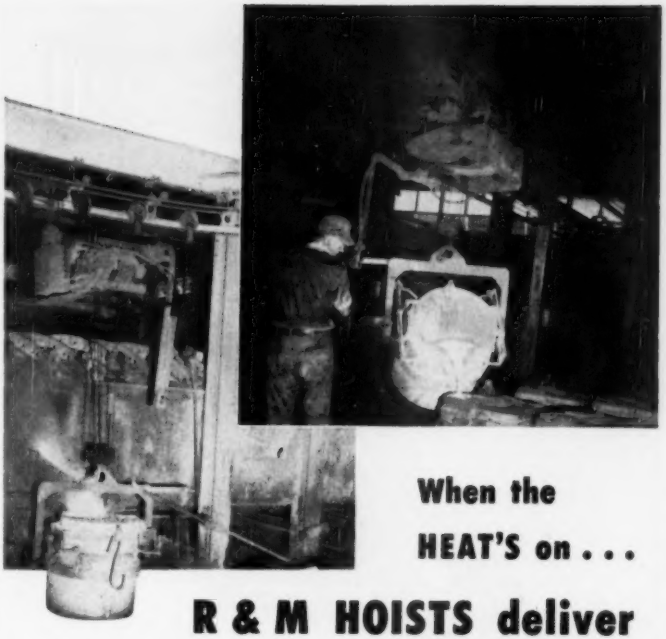
A self-centering vise mounted on a swivel-plate, calibrated in degrees, is provided to allow speedy change from straight or 90 deg cutting to any angle. Motor is 5 hp, geared-in-head induction type with speed of 3500 rpm; wheel spindle speed is 2380 rpm. Requires 21½ by 4 ft of floor space. Shipment includes arbor flange and nut, wrenches and can of grease. Shipping weight 600 lb. Stone Machinery Co., Inc.

## 15—VIBRATION MOUNTS

### For isolated horizontal and rotary machine vibrations

Finnflex CM-H Vibration Mount is designed for use with precision grinders, lathes, generators, pumps, compressors, jig borers and other installations where horizontal and rotary machinery vibrations are present.

Vibration isolation and noise reduction is accomplished through "rubber-in-shear" principle. It consists of a steel channel floated in rubber between two steel angles. The correct angularity between steel parts and rubber bonded thereto is said to enable isolator to approximate the "flat" spot on a stress-strain curve of relative slope. Because the spring index is not

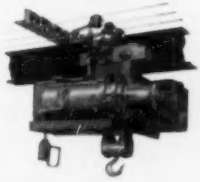
When the HEAT'S on . . .

R & M HOISTS deliver

Nine R & M hoists give super service in scorching temperatures on the pouring floor of a foundry in Ironton. Every day these hoists move from 350 to 400 tons of molten metal from furnace to flask. A special bearing is used in the block because of the sizzling heat. In photo, note low headroom required. This is characteristic of R & M hoists. Every day these hoists meet the grueling requirements of this foundry and thousands of other plants. They up production, lower unit costs, increase profits.

"TAKE IT UP WITH R & M"

From the new "J" hoist, with its ¼-ton capacity, to 25-ton cranes, R & M manufactures a wide range of versatile handling equipment for the toughest work. If it's a job for a hoist, crane or winch . . . Take it UP with R & M.



Electric Hoists
Capacities From
250 to 20,000 lbs.

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• HOIST & CRANE DIVISION •
SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

# The 7-Range Clip-On Volt-Ammeter

FERRANTI

*Offers These Important Advantages*

- Measures up to 1000 amps. up to 600 volts.
- Convenient ONE HAND operation trigger action.
- Thumb operated range selector switch.
- 7 ranges—5 current and 2 voltage.
- Insulated core—shockproof construction.
- Takes cables up to 2¼" diameter.
- Distinct calibrations—easy to read.
- Suitable for 50-70 cycles.

RANGES: 0-10 amps; 0-25 amps; 0-100 amps; 0-250 amps; 0-1000 amps; 0-150 volts; 0-600 volts

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FERRANTI, LTD., Hollinwood, England — FERRANTI ELECTRIC, LTD.

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## REDUCES PRICE OF
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## 7-RANGE CLIP-ON VOLT-AMMETER

We are pleased to announce that effective immediately we can offer a substantial reduction in price on this superior instrument. The new low price reflects the full reduction in our cost resulting from the lowered dollar value of the pound sterling. It involves absolutely no change in the superb qualities of the instrument itself. Take advantage of this truly exceptional value now.

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**30 Rockefeller Plaza, New York 20, New York**

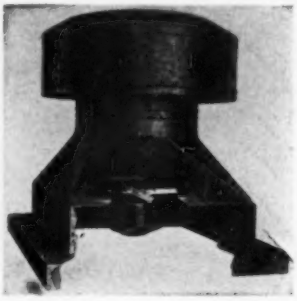

constant, resonance is said to be avoided.

These isolators, with ample surface mounting areas, are designed to afford uniform deflection and a load range from 600 to 10,000 lb. Finn & Co.

### 16—ROOF VENTILATOR

**Is round stationary type, for general ventilation or hot spots**

The Valvent, is made in five throat sizes from 12 to 36 in. An unique feature is the combination damper and inverted cone air guide, said to guide outgoing air with least possible friction and permit any degree of opening, or tight closing. While



standard construction is of galvanized steel, it can be made in other metals. Made both as a gravity ventilator and a powered unit—the latter form offering capacities from 630 to 25,700 cfm, according to combination of motors, fans and throat sizes. The Swartwout Co.

### 17—STRONG ADHESIVE

**For adhering rubber to concrete, needs no heat or pressure**

Magigrip is described as waterproof. In addition to rubber-concrete applications it is recommended for adhering metal, cork, glass, brick, marble, wood, plastic, mirrors, tile and asbestos. Adhesive Products Corp.

### 18—NON-SKID FLOOR PLATE

**For sure footing, is made of rolled steel and abrasive grain**

The A. W. Algrip Floor Plate is recommended for industrial floors, loading platforms, ramps, walkways, trench and hatch covers and wherever there is danger of men slipping. With it there is claimed to be no slipping—even on steep inclines. And, as manufacturer explains, it doesn't lose its non-slip characteristic, because as the surface wears, new abrasive particles are constantly exposed.

Abrasive grain, the same type used in grinding wheels, is rolled as an integral part of the upper portion of the steel plate. It can be sheared, drilled, countersunk, machined and flame cut, according to company, but flanging is not recommended because the abrasive material is non-elastic. Plates are available in thicknesses from $\frac{1}{8}$ to $\frac{3}{8}$ in. and in sizes up to 60 in. wide by 144 in. long. Alan Wood Steel Co.

### 19—PIPE THAWER

**Is portable electric machine with broad range of usage**

Originally designed for thawing iron water pipes, this thawer is now engineered to handle copper tubing and lead pipes. An optional themostatic control permits automatic regulation of temperatures. Application is also extended to include heating pipes carrying noncombustible liquids and where lower viscosity is required. Machine is said to thaw a $1\frac{1}{2}$ in. pipe 30 ft long in a matter of minutes. Trindl Products Ltd.

### 20—BLOW TORCH

**With polished brass tank, is popular priced for general use**

The No. 330 S Superior blow torch has a shut-off valve equipped with replaceable needle pin which won't break off according to manufacturer; and a small spring on the pump plunger washer keeps the washer spread for positive pumping action. The pump itself is described as blow proof. The fuel line from the tank to the

burner is equipped with a mesh strainer control to prevent flash back. Other features include a reinforced bottom, steel priming cup, and long undervein with cleanout plug.

Tank inlets and connections are mechanically locked into position. The pump is removed to fill the fuel tank on the No. 330 S blow torch; however, another model of the same torch, No. 330 BS, is filled through the funnel shaped bottom equipped with a filler plug. Both models are 1 qt capacity. P. Wall Mfg. Co.

## 21—RESIN CEMENT

**Is chemically setting synthetic resin for difficult applications**

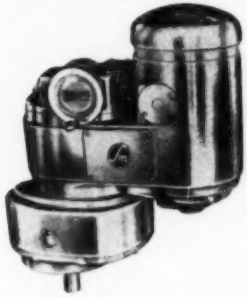
This cement is said to withstand acids, alkalis, solvents, hot water and steam, and is credited with high tensile, compressive and bonding strengths, extreme density, low absorption and good temperature resistance.

It is recommened for use on acid pickling and neutralizing tanks, plating room floors, drains, sewers, linings for chemical processing tanks and other installations requiring acid or alkali resistance or both. Shipped in two containers, a liquid and dry powder for mixing at time of use, both liquid and powder are described as stable in storage and non-toxic. The Cellcote Co.

## 22—VARIABLE SPEED MOTOR

**Has power unit mounted integrally with pulley, shafts and belt**

The Speed-Trol is a vertically mounted motor incorporating company's Herringbone rotor, labyrinth seals, heavy-duty ball bearings, and a streamlined case. It is available with integrally built helical gears. Another feature is fingertip control of speed with large easy-to-read speed



indicator allowing speed adjustment through either the fingertip control on the motor or through mechanical, electrical or lever-type controls.

Because of its compact face mounted construction (also available with flange mounted construction) this power drive is recommended for agitator drives and for building into machines. Sterling Electric Motors, Inc.

## 23—THERMOMETERS

**Hand or mounted immersion types for high temperature use**

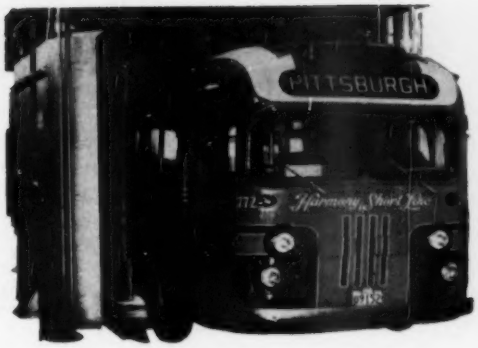
These thermometers are designed for readings to 1 per cent accuracy from 350 to 1500 F. (or equivalent Centigrade). They have 4 in. dial scale, 8 in. scale length, and come in six temperature ranges from 50 to 350 F to 200 to 1500 F. Hand thermometers for ranges over 800 F have stainless steel immersion bulbs 9 in. long with 24 in. extension to instrument dial. Copper and brass are standard bulb materials under 800 F.

Panel and flush-mounting thermometers have flexible armor covered tubing. Prolonged immersion in liquids within temperature range will not cause damage, manufacturer states, adding that other advantages include light weight, low internal pressures and fast response. Delivered price in United States is $39.50. Seico, Inc.

## 24—ABRASIVE SAW

**Is engineered for fast cutting of heavy pipe, other materials**

Using a wheel which is abrasive throughout the entire body of the blade rather than on the cutting edge alone, the Speedmatic Saw is designed to score even heavy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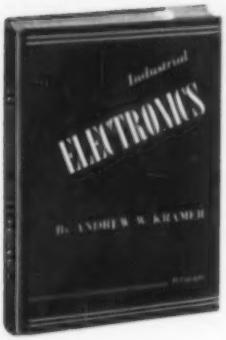


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**53 WEST JACKSON BLVD. CHICAGO 4, ILLINOIS**


case iron pipe. Saw is easily adapted to follow contour of pipe; either blocks or rollers can be attached to standard saw base. The wheel is adjusted for the cut with the micrometer set screw which raises or lowers blade ⅛ in. for each turn.

The saw also cuts other metals, ceramic or plastic materials, tile or concrete pipe, bricks, cement or cinder blocks. A special blade permits use on sheet aluminum, galvanized steel, and corrugated steel and aluminum siding or roofing. Available in four sizes for cutting 2½ to 4⅛ in. and adjustable for any cut between 0 and 45 deg. Porter-Cable Machine Co.

Saw

Ladder

## 25—AERIAL LADDER

**Aluminum extension type, is designed for truck mounting**

Overhead maintenance jobs, storeroom work, painting and construction work can, in many cases, be performed easier and faster with this extruded aluminum platform ladder built for mounting on materials handling or other truck bodies.

The ladder is transported in a retracted horizontal position parallel to the long axis of the truck, its retracted length being half the extended length. Intended for interior or exterior use, it extends to a height of 28 ft and rotates 360 deg. (Other models come in lengths up to 60 ft.) Manual or hydraulic actuation controls inclination of ladder to as much as 14 ft laterally from center of truck to permit working platform to reach positions over machinery. Working platform has guard rail.

Erection of ladder can be handled by one man, company states, adding that this ladder is 100 lb lighter in weight than many all-aluminum ladders. Aero Metalcraft Corp.

## 26—SMALL AMMETER

**For operating over wide range in checking flow of current**

The Mini-Amp is described as "burnout proof," accurate, dependable, and inexpensive. It is designed so current-carrying wire is slipped through opening in the case, and the knob turned until the indicator light extinguishes. Then current is read in amperes off the dial.

The range may be changed by increasing the number of wire passed through the opening. The scale range of Model 810 is 10-24 amp; may be extended down to 0.1-0.24 amp. Industrial Devices, Inc.

## 27—POTENTIOMETER

**Is portable unit for corrosion testing where needed**

This instrument is designed to give fast, accurate readings over the wide range encountered when investigating galvanic and electrolytic action along pipe lines, cables and other buried metal structures.

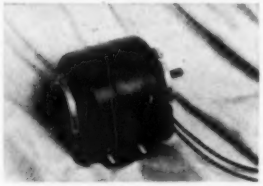
Total range is 0 to 4.1 v, measurable in 1 mv steps. This range is subdivided into 12 different steps, some of which overlap. Easy-to-use switches and keys make it possible to select the portion of the total range best suited for the problem at hand.

An emf reversing key is provided for measuring opposite polarities without changing leads. Current is provided by flashlight batteries. Binding posts are provided for connection to any external 6 d-c source when needed. The entire unit is housed in an oak case. Weight, including batteries, is about 10½ lb. Leeds & Northrup Co.

## UNIT-BEARING MOTORS

**Oil lubricated, shaded-pole type, for all-angle operation**

ed for operation in any position—up, down, horizontal, or at any angle. motors are designated as Type KSP. me sizes 11 and 21, they can be used ves for exhaust fans, cooling fans, ative collers, unit heaters, condenser g, and space heaters, as well as for pumps, agitators, and blowers. lable in either open or totally en-



construction. Ratings range from p (1/40 hp) through 1/12 hp at 115 v., 1050 or 1550 rpm, 60 cycles. r lubrication system is designed to e a constant flow of oil from a large oir to bearing surfaces regardless of n of the motor. Oil-saturated pack- continuously feeds bearing with l oil, according to company, and no nual lubricant is required. Fractional ower Motor Divs., General Electric

## SNOW PLOW

**For hand tractors, has blade with built-in rotary fan**

inoclone has a formed steel blade a built-in rotary fan that actually snow from sidewalks, drives and g lots. Power is transmitted from ractor motor through a belt drive he entire unit can be attached by our bolts. The Wonsetler Co.

## RUBBER SPRAY HOSE

**Is made to utilize working pressures as high as 800 psi**

pray hose is made in long lengths esigned to handle many sprays pre- destructive to rubber hose. ufacturer says this hose has greater th and less friction loss because of remely smooth tube. pounds of oil resistant rubber make se satisfactory for use with oil emul- t can also be employed on hydrau- uipment and in car washing units. d construction with a new high cotton yarn makes possible the only two braids in all sizes except in. which is made in three braids. size has 13/16 in. OD. 7/16 has $\frac{7}{8}$ has 31/32 in. and $\frac{3}{4}$ has 16/16 in. is black, lead press molded finish. . F. Goodrich Co.

## ELECTRONIC DRIVE

**For controlling speed of fractional horsepower motors**

Mot-O-Trol adjustable speed drive stops and controls the speed of $\frac{1}{8}$ hp d-c motors operated from single- 50-60 cycle, 220-440 v power sources. armature control to make possible ge of 20 to 1 at constant torque. h stepless control is said to be as-

NO OTHER SPRAY BOOTHS GIVE YOU ALL THESE ADVANTAGES

1 **APPROVED PERFORMANCE AND CONSTRUCTION**
When you install a Binks Dynaprecipitor Spray Booth in your finishing department you have done everything possible to eliminate fire and health hazards. These booths meet the requirements of local and state authorities...are endorsed by insurance companies. They are the mark of a safely equipped shop.

2 **EXHAUST AIR WASHED 5 TIMES**
The patented Dynaprecipitor principle draws fumes and over-spray through 5 unbroken water-curtains before it is vented... clean and dry.

3 **NO NOZZLES TO CLOG**
The unique water distribution system in these booths eliminates nozzles... guarantees thorough washing.

4 **FASTER PRODUCTION**
Stops *drift*...lets you place spray stations closer to each other. Minimizes clean-up time.

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There is no paint smell...air in the shop remains fresh...and the shop stays cleaner.

6 **RECLAMATION OF OVER-SPRAY**
All paint is washed out of the over-spray and trapped in the collecting pan where it can be easily reclaimed.

7 **SIMPLIFIED CONSTRUCTION**
Dynaprecipitor booths are shop fabricated in standard sizes from 4 to 20 feet wide. Panels bolt together with gasketed joints, quickly and simply.

8 **PRICED RIGHT**
This is equipment on which you do not pay a premium to get the best. Dynaprecipitor spray booths are unsurpassed...but you don't pay any more for them.

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The same water is recirculated. Only cost is operation of the circulation pump.

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# TEMPERATURE ATLAS REGULATORS

BULLETIN No. 6-A illustrates and describes in full ATLAS Hydraulically and Pneumatically Operated Temperature Regulators for hot water heaters, storage tanks, cooking vats, retorts, ovens, kilns, pasteurizers, etc. A 20-page bulletin.

BULLETIN No. 7-A shows the ATLAS Self-Contained Vapor Type for Liquids, among which are those described below as well as others. A 16-page bulletin.

In other words, there is an ATLAS for every temperature regulating service.

## ATLAS No. 650

Balanced Type Double Seat Valve. Self-Contained Spring Adjustment. For temperatures from 70° to 300° F. Bulb is immersed in liquid and control valve installed in steam supply. ½", ¾", and 1" for steam pressures up to 150 lb, 1¼", 1½", 2", and 2½" for steam pressures up to 100 lb. Operates in vertical or horizontal position.

## ATLAS No. 651

Needle Type, Single Seat Valve. Self-Contained Spring Adjustment. For temperatures from 70° to 300° F. Used where tight seating valve is essential such as on small oil heater pump sets, open or closed tanks, sterilizers, glue heaters, etc. ½" and ¾" for steam pressures up to 150 lb. Operates in vertical or horizontal position.

## ATLAS No. 655

Balanced Type, Self-Contained, Double Seat Valve. Lever and Weight Adjustment. For temperatures from 70° to 300° F. Levers and weight adjustment of control valve assure high sensitivity. For maintaining temperature of liquids in all kinds of tanks and heaters. ½", ¾", 1", 1¼" and 1½" for steam pressures up to 150 lb. 1", 2½", 3", 4", 5", 6", and 8" for pressures up to 100 lb. Operates in horizontal pipes.

## ATLAS No. 660

Single Seat Self-Contained Pilot-Operated Valve. Spring Adjustment. For temperatures from 70° to 300° F. For use where accurate regulation demands a quick opening and closing control valve and where steam pressure is always 25 lb. or more, as for instantaneous heaters and tanks for water, oil, etc. ½", ¾", 1", 1¼", 1½" and 2" for steam pressures up to 300 lb. 2½", 3" and 4" for steam pressures up to 250 lb. Operates in vertical or horizontal position.

## Other ATLAS Products:

Check the items below on which you would like to have data and mail to us with your name, firm name and address.

- ☐ Temperature Regulators
- ☐ Damper Regulators
- ☐ Reducing Valves
- ☐ Exhaust Control Systems
- ☐ CAMPBELL Boiler Feed Water Regulators
- ☐ Pump Governors
- ☐ Pressure Regulators
- ☐ Oil Control Cocks
- ☐ Humidity Controllers
- ☐ Thermostats
- ☐ Balanced Valves
- ☐ Control Valves

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sured on speed increase or decrease. The drive is designed to provide dynamic braking, overload and low-voltage protection, and to operate without separate field rheostats and linestarters.

A compact control station is supplied for separate mounting at a convenient location. This control station is used to control starting, stopping, direction of rotation (on reversing design) and speed. Other components, used to rectify a-c power for the d-c motor, are enclosed in a wall-mounted NEMA Type 1 enclosure. Westinghouse Electric Corp.

## 32—COMBINATION CUP-GAGE

**Combines visible oil cup and visible oil gage in a single unit**

This combination device can be used as a visible oil cup to replenish oil in bearings, transmission and crankshaft cases and also as an oil gage for checking oil levels periodically. Because of the visible feature it can be installed at any convenient distance from the machine.

A clear, shatter-proof plastic bottle is used to keep oil supply visible. Metal parts are heavily plated for corrosion resistance and easy cleaning. Has large, self-closing filler cap. Heavy steel base is cemented and roll-clinched to plastic reservoir to eliminate possible leakage. Easily installed. Available in 1, 2, 4, and 8 oz capacities. Trico Fuse Mfg. Co.

## 33—SAFETY TREADS

**To be worn over shoes wherever it's slippery underfoot**

Tigerfoot Safety Treads are intended to prevent falls on greasy, wet or icy floors, ramps, scaffolds, decks or yards. Easily fitted over and removed from boot or shoe, these sandal-like attachments have soles of a tough, slip-resistant fabric. The New Products Development Corp.

## 34—Y-TYPE STRAINER

**For protecting steam traps, reducing valves, temperature controls**

This low cost strainer is recommended for removing impurities such as lint, scale, dirt or sand from steam, air, water or gas. Special features include monel screen, heavy semi-steel body with self-centering screen guides to prevent crushing, easily-removed screen, gripping lugs on inlet and outlet bosses to permit installation with any type of wrench.

Sizes range from ⅛ to 2 in. for steam pressures to 250 psi, or cold pressures to 400 psi. Cast steel strainers are available for steam pressures to 600 psi, in sizes from ¼ to 4 in. Strong, Carlisle & Hammond Co.

## 35—MAINTENANCE PAINT

**Based on chlorinated rubber, for great chemical resistance**

The chemical resistance of Uclon 1701 is considered of value where the usual oil or oleoresinous paints may not be satisfactory. Uclon 1701 is claimed to be of advantage in contact with acid and alkali fumes, moisture, vapors, grease and oils. It is suggested as a coating for floors, walls, ceilings, exteriors of storage tanks, structural steel and exteriors of process tanks and machinery in industrial atmospheres.

Uclon 1701 is recommended for use on metals, wood, brick and concrete. It can be applied over old paint or other surfaces without priming and without sandblasting or other expensive surface treatments, company states, but loose scale should be removed first. One or two coats are required. Coverage is 350 to 500 sq ft per gal, depending on smoothness and porosity of surface. Available in full range of colors. United Chromium, Inc.

## 36—VARIABLE VOLUME PUMP

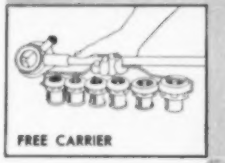
**For industrial oil burners; meters fuel to rotary atomizing cups**

With the Oil Volumeter, a positive displacement pump submerged in the oil reservoir, company's oil burners can burn any weight of industrial oil from No. 1 to No. 6 or Canadian Bunker Q oil without manual adjustment, it is announced.

The amount of oil fed to burner is determined by the movement of pistons in multiple cylinders. The rate of feed is governed by length of piston stroke, which in turn is controlled by a cam mechanism. It is claimed that neither oil temperature nor viscosity affects feed rate.

A gear-type pump with return flow to


Beaver



FREE CARRIER

## No. 3 Ratchet Threader For Pipe, Bolts, Conduit

**Beaver No. 3 Ratchet Threader** is a deluxe tool with fully-enclosed ratchet teeth that cannot get gummed-up or mutilated—thus eliminating the danger of serious accidents caused by ratchet slippage.

Die segments square in shape—no weak sections—are easily removable for sharpening and can be inverted for close threading. Ample openings between segments for oiling and chip clearance.

Diehead carrier free—enclosed metal tool-box available extra.

**Beaver No. 3 threads Pipe, ⅛ to 1"; Bolts, ¼ to 1"; Conduit, ½ to 1"; Brass Tubing, ¾-20; ⅝ or ¾-27 Thread. Also specials.**

Write for complete new Catalog No. 49—free! It shows a complete line of hand tools, ⅛ to 12-inch; electric pipe & bolt machines, power drives, etc. Address Beaver Pipe Tools, Inc., 210-300 Dana Avenue, Warren, Ohio, U. S. A.

*50 Years of Friendly Service*

BEAVER PIPE TOOLS

oil tank is intended to maintain a full reservoir with reserve oil capacity. Air from the suction line is automatically vented from top of reservoir. Manufacturer says this pump eliminates unsteady fire and starting failures which often hamper use of low-cost but high-heat industrial fuel oils. Iron Fireman Mfg. Co.

## 37—OVERHEAD CONVEYOR

**For light or medium conveying, has universal joint chain**

The Un-O-Veyor chain is described as possessing great carrying capacity and strength. Its malleable iron link and uni-

versal joint is formed into one integral unit and a clevis arranged at multiples of 9 in. Each link has a set of 2 in. dia hardened steel ball-bearing wheels, the load carrying wheel being vertical and the next link having its wheels horizontal to carry the thrust around corners. Michna Systems.

## 38—PROTECTIVE COATING

**To keep steel beams from collapsing in the event of fire**

This fireproofing cement for application 1-¾ in. thick on beams and steel equipment is reported to retard the effect of great heat for three hours, and thus prevent the steel from crumpling within a short time in the presence of an intensely hot blaze.

Manufacturer points out that it is much lighter in weight than many products previously used for this purpose, costs less, and can be troweled on without the use of forms. A further advantage claimed is the ability to resist spalling or crumbling, which it is said to retain even under high pressure fire hose streams if an outer coating of harder material is applied as recommended.

It is especially recommended for use in chemical plants, oil refineries and industrial structures where exposed steelwork is part of the structure. It is said to protect against effects of fire on all parts of a structure without adding a prohibitive amount of weight and is suitable for large or small areas.

Sold as a gray, powdered material, it forms a stiff paste when mixed with water, and is troweled onto ribbed metal lath wrapped around the steelwork to be protected. Eagle-Picher Co.

## 39—POWER SPRAYER

**For use with insecticides, fungicides and disinfectants**

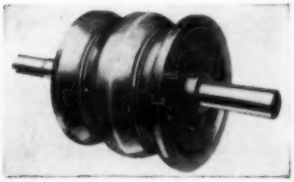
The Streme-Liner Sprayer is built with a 50 gal steel tank, 2-cylinder pump with double piston action designed to discharge over 3 gpm. It is powered by a 1½ hp single-cylinder 4 cycle air cooled gasoline engine or ¾ hp single-phase 110-115 v induction repulsion electric motor.

Includes 10 ft of ⅜ in. high pressure spray hose with a 2 ft extension. Skid mounted the Streme-Liner costs $285, wheel mounted $340, and mounted on Towabout platform, $410. Samuel and Hirschberg.

## 40—PIPE AND SHAPE ROLLS

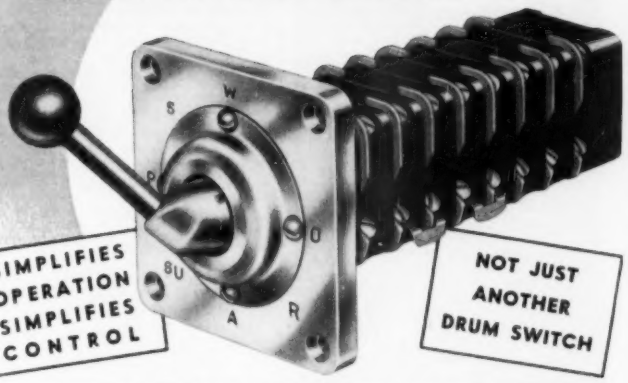
**Are permanent non-electric type, for galvanizing operations**

These units are intended to eliminate burnouts and maintenance problems caused by high ambient temperatures, steam and fumes. Fabricated from permanent non-electric magnets, the rolls are designed for the "drag out" of pipes and




The New PUSH-PULL SELECTOR SWITCH

ARROW AH HART




SIMPLIFIES OPERATION SIMPLIFIES CONTROL

NOT JUST ANOTHER DRUM SWITCH

THIS REVOLUTIONARY SWITCH CUTS CONTROL COSTS

The new Arrow-Hart PUSH-PULL-SELECTOR Switch gives a single point of control for multiple-operation machines. Any combination of contact elements can be arranged — to act in place of push buttons, relays and contactors — to start or stop action. Up to 16 dial positions available. Stop or start in any position — move from any position on the dial to any other position without activating any intervening operation. Control and load circuits may be combined in as many sections as required. Each section has 2 completely separate circuits; each can be opened or closed independently in all positions. Any combination needed can be used in any position — 3-wire or 2-wire control.

SAVES TIME, MONEY AND VALUABLE SPACE

Arrow-Hart PUSH-PULL-SELECTOR Switches can effect big savings in electrical control costs. Save installation and operation time through simple, central control of multiple operations. Save money through lower initial costs and elimination of many components. Safe, foolproof operation from only one point of control.

CUSTOM BUILT TO YOUR SPECIFICATIONS

These A-H "PPS" Switches are designed to your individual specifications. Each is a custom-built control. Our design, production and assembly facilities are at your disposal — to give you the finest in electrical control equipment.

TELL US YOUR CONTROL PROBLEMS — give us your requirements — and we'll design a "PPS" Switch that will give you years of economical, efficient and maintenance-free service.

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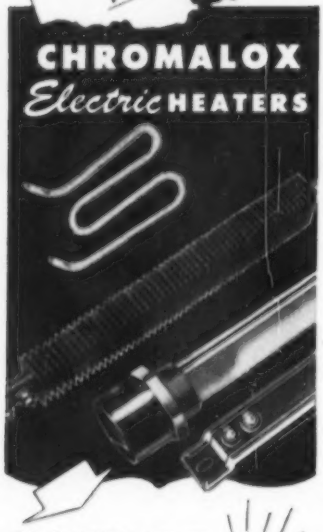

Only CHROMALOX gives you such a wide selection of Electric Heaters for heating gases, air, liquids, platens, dies, molds, ovens, soft metals and countless other heating uses. They are easily installed and provide concentrated and "controlled" heat that is dependable, safe, clean and economical.

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FOR MODERN INDUSTRY

shapes from galvanizing pots, and to withstand temperatures up to 900 F.

Fumes and moisture are claimed to have no effect on these rolls, and their magnetic strength is expected to last indefinitely. Installed at the end of the galvanizing pot, pipe or shape is placed in the contour of the roll and the galvanized material is magnetically guided to and through a steam or air blast where excess zinc is removed.

The pipe roll's magnetic field is designed to automatically center pipe or rounds to effect a minimum clearance between pipe and steam eye. Shape rolls have a completely magnetic surface for conveying any size or shape of material. Pipe rolls are ordinarily installed four to six rolls to a tandem; pipe from ⅜ to 6 in. dia can be handled. One or two shape rolls are required for conveying. Eriez Mfg. Co.

## 41—CHEMICAL FEEDER

**Is compact, self-contained unit of transparent acrylic plastic**

Measuring about 10 by 5 by 2 in. over-all, the Feed-Rator is designed to simultaneously control, meter, and dispense relatively small amounts of bactericides, catalysts, disinfectants, fungicides, inhibitors, reagents and other chemicals into a larger stream. By means of the built-in eductor, corrosive chemicals can be fed directly from a container, it is pointed out.

The unit is built to treat up to 7000 gal per day of water directly. In a bypass arrangement using a solution containing 5 per cent active reagent by weight, 5 ppm of the reagent can be delivered to over 14,000,000 gal of water a day, according to manufacturer. Fischer & Porter Co.

## 42—PAINT STRIPER

**Has gravity feed, controlled flow; in 5 and 9 gal capacities**

This striper has a brushless, gravity feed, sled-type paint spreader that can accomodate any standard striping or zone paint. With the use of a special shoe, reflective paint can be applied. Machine is said to be noiseless, to throw off no spray dust and be easily cleaned.

Made of steel, the striper applies paint evenly over entire width of stripe, company states. Interchangeable spreaders

come in widths from 2 to 8 in. Intended for use on concrete, asphalt, wood, macadam or any other reasonable smooth paving surface.

Machine is offset in operation and allows operator a clear view of line. Wheels are cast aluminum alloy, but rubber-tired ball bearing wheels are optional at additional cost. Universal Marine & Mfg. Corp.

## 43—ELECTRICAL TAPE

**Is extra thin and designed for withstanding severe conditions**

Dutch Brand Plastix Electrical Tape is described as superthin and high in dielectric resistance. It has as high as 200 per cent stretch and conforms to irregular surfaces, company states, and resists water, oil, acids, alkalis, and corrosive chemicals. Tape is put up in five rolls in a handy screw-cap container. Van Cleef Bros., Inc.

## 44—UPENDING TOOL

**For barrel and drum handling, has tension clinching feature**

The E-Z-Up has v-shaped strap-iron saddles located at the points of leverage and lifting. The leverage saddle at the end of

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the tool laps over the top expanded rolling hoop, while the lifting saddle fits tightly to the drum head at two points under the rim which supports the weight. As leverage is applied, pressure forces the saddles to spread and grip the drum surfaces.

This tension-clinching feature adds safety for workmen because drums cannot slip or roll, regardless of how greasy or slippery, states manufacturer. Weighing only 6 lb, E-Z Up is made of 1 in. heavy-wall tubing of all welded construction and is 42 in. long. The D. S. Campbell Co.

*(Continued on page 72)*

## Should Maintenance by Contract be Encouraged?

*(Continued from page 43)*

pair organizations available to effect repairs at a much lower cost than the usual plant maintenance organization, where no one is an expert in any particular field and where the expense of stocking the proper tools and replacement parts is far too great. It is the writer's opinion that plant engineers should thoroughly investigate the services available for the repair, not only of heat exchangers, but of any specialized equipment.

**Contributed by**
**George H. Kimball, Superintendent of Power and Maintenance**

FIRST, it seems to me that this question is greatly concerned with, and affected by, the size of the plant and the product manufactured. In our plant, in which the total number of employees is between 600 and 700 and the buildings occupy a city block 200 by 400 ft in area and running up five stories, the scope of the plant engineering department cannot be compared with that of a plant employing thousands, with acres of floor space and a multiplicity of processes.

The total number of employees whose work comes under the head of maintenance is about 50. Only 30 of these come under what is known as the Maintenance Department, the remaining 20 are those engaged in cleaning and handling material in process to some extent. There are about eight employed in two small machine shops which take care of the machines in the two principal production departments.

**With one method, we have less expense and confusion in the productive area. With the other, greater expense but quicker completion and where skill or experience is a factor, a better job**

Under the Maintenance Department comes the care of the buildings, together with plumbing, heating, grounds, power and electrical equipment and the care of the offices and general stairways and passage ways that are used commonly by all other departments.

Almost all carpenter work is handled by a shop employing three men, there are two painters employed but for painting jobs of large scope it has been found better to employ outside contractors. If four painters were employed, much of this work could be done by our men.

It is quite obvious that any project


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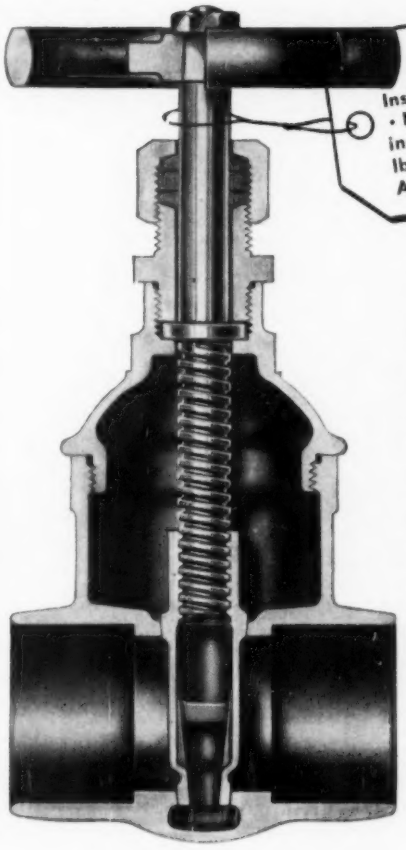

**FIGURE 1-SJ**
Inside Screw • Wedge Disc • Non-Rising Stem • Working Pressure: Steam 100 lbs.; Water 150 lbs. Sizes Available: ⅜" through 2".

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SAFETY because they eliminate dangling cords that can so easily tangle with work or tools or machines.

ECONOMY because the tough neoprene jacket resists abrasion, acids, grease, oils, light and other harmful conditions and substances. Koiled Kords cannot kink and tangle which means fewer replacements.

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that can be handled by the plant employees will be much less in expense than if it were done by a contractor for they are more conversant with the general layout, the problems of production and can often do the work with less disruption of the manufacturing processes. A contractor who is working with a limited estimate cannot be hampered too much or the work will run into extras.

If our groups could devote their undivided attention to a project when once they have begun work on it, much could be gained by not letting it out. It is however usually the case that other problems creep in through requests to repair something that has broken down. Invariably these demands arise and the result is that the project may be held up for an indefinite period.

It has always seemed to us that any increase in the expense of labor is sharply questioned by the top management since it affects the overhead expense. It is true that the addition of one man in a group of this size looms up to a greater degree than it would in a group employing 200 men, and, thus in the larger group there is always more opportunity for certain employees to be available for projects that could not be accomplished by the smaller group.

So, with one method we have less expense and confusion in the productive area while with the other we have greater expense, but quicker completion and in cases where the matter of experience and special skill is present, a better job is performed. In view of the above, it is my opinion that there is a place for the contractor in many plants and for the plant engineer in all of them.

Contributed by
A. M. Elliott, Industrial Engineer

SIZE OF THE physical plant and its diversity should be the measure of the amount of contracted maintenance rather than the personnel factor. For example the requirements of a machine shop handling raw stock from forgings through machining, heat treat, assembly, testing and packing, employing 850 people should present no problem the maintenance department cannot handle themselves, assuming the plant is in operating condition. This, however might not be the case with a similar or smaller size plant operating as a job shop or process industry where complexity of operations or intermittent downtime seems to warrant farm-ingout repairs and overhauls.

In many instances a self-contained and independent shop can handle a new addition once the building structure is up, painted and floored. Plant

As to accounting procedure . . . the application of overhead to overhead, or, charging burden to the master mechanic's department is not good accounting practice . . . (supervisory) costs might be applied to different service departments and re-applied to direct plant labor from there.

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PE 1-50

plumbers, electricians and millwrights could easily take over from there and judging by some of the work turned out by contractors these days: 'twere better they did. A governing factor of course would be the time allowed, as naturally where breakdowns have a prior claim on the maintenance crews' time, there is going to be far more lag due to both the interruptions themselves and the lost time getting tools back to the site and getting started again, than if a crew were left there uninterrupted. This is virtually impossible, except by contract.

Now, while this and other points appear strongly in favor of contracts, the costs and advantages are not all on the surface. Regardless of how astute and conscientious the engineer in charge may be, he cannot cover all phases nor foresee all contingencies. While the contract job is being done under his supervision he is not going to inspect every piece of equipment installed, especially, if the job is large and his staff small or non-existant.

For example, if an outside contractor installs complete plumbing in a 60,000 sq. ft. addition including high pressure steam lines, and, these same men hook low pressure regulators and allied equipment into this line for hot water service, one can hardly blame the PE for missing this both during installation and perhaps the early stages of operation. From floor level, high and low pressure equipment 15 ft in the air looks the same and actually only scrutiny of name plates reveals the fault.

There are, of course, many instances where outside help is the natural choice for both economical and practical reasons. It would be a plant of very considerable size that could warrant staff-help and rigging for such jobs as: replacement of power house chimneys; lightning rods; descaling and repainting the water tower; etc.

Stressing of skill casts no reflection on the regular maintenance gang and certainly need detract nothing from the PE. Practice makes perfect and perfection reduces time and therefore the highest cost—labor. Too, a well-intentioned boss and crew might give their "all" to do a bang-up job on the once-in-a-great-while painting of such equipment as the plant's 150,000 gallon oil storage tank and blow it all with a fatal accident. This specific instance while not complex just cannot be accomplished efficiently without the proper rigging, the puchase of which for a single unit would be wholely unwarranted, actually equal to the total of an outside contract.

As to other small specialties such as the maintenance of electronic equipment, automotive or even the executive aeroplane, it becomes generally a matter of product skills. Personally while 13 prime movers, 5 highway trucks, sundry plows, tractors and company cars are regularly scheduled for attention under a preventive maintenance plan, annual overhaul is by the manufacturer's representative on all complex and heavy duty vehicles. The paint job however is done by the shop.

There is also, though perhaps minor, a certain influence exerted by the extra-curricular activities or hobbies of the PE or perhaps another member of the staff that might affect the maintenance of say electronic units or even landscaping. More and more plant engineers and maintenance personnel are tying a home inspired interest into community betterment on a proportionately larger scale as members of the Association of Horticulturists in Industry.[3]

As to accounting procedure, here again diversity of maintenance and size of plant play a strong part. The application of overhead to overhead or charging of burden to the master mechanic's department is not good accounting practice. However should the plant be large enough to warrant a Plant Engineer's staff of assistants, draughtsmen, supervisors, etc., their cost might be apportioned to the different maintenance or service departments and of course reapplied to direct plant labour from there.

Summing up therefore we find a successful PE like any able administrator marshalling his forces or husbanding his resources for the combatting and despatch of his problems, foreseen and contingent, with due regard to efficiency and economy of operation, and, with these uppermost, making full use of facilities, knowledge and help he has, but never hesitating to farm-out, or ask in, when discretion dictates.

[1] Of a Massachusetts corporation.
[2] Of a New York state corporation.
[3] The A.H.I. is an organization started in 1947 to further the development of attractive industrial premises and promote better industrial landscaping and grounds maintenance. The annual individual membership rate is $5.00. See p. 4, February 1949 issue for further details. Arthur C. Stone, Director of Grounds, Joseph E. Seagram & Sons, Inc., Louisville, Ky., is secretary of the association.


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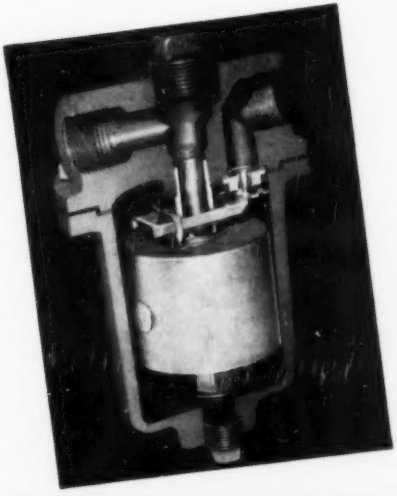
## SUPER-SILVERTOPS



In this cutaway view of an Anderson Super-Silvertop Steam Trap, you can see that all pipe connections are in the head of the trap. The alternate top inlet connection provides for elbow connection as well as straight-in-line. This means simplified piping, saving up to nine fittings, plus 40 minutes of costly installation time. See how the guided bucked permits the use of a longer lever arm with greater valve opening power. This larger valve means more capacity for the same size trap. Super-Silvertop trapping is efficient trapping . . . *the most economical you can buy*. Learn how to cut your costs by writing for the free 36-page book, "Solving Steam Trap Problems."

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# SAFETY
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## Model PUL TELESCOPER
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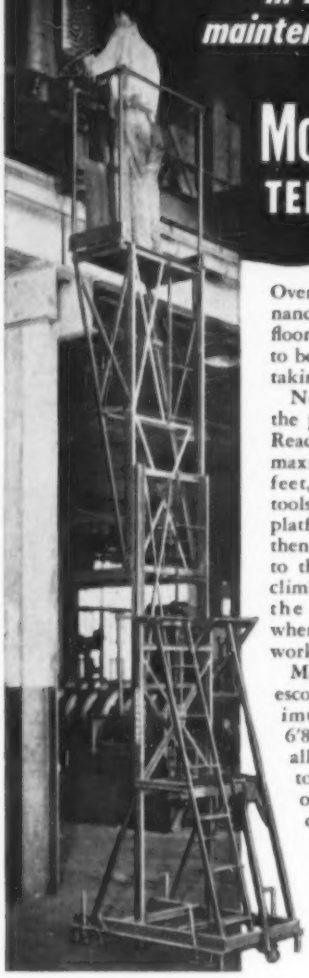

Overhead crane maintenance 22 feet above the floor, as illustrated, used to be a hazardous undertaking.

Now one man sends the platform of this Hi-Reach Telescoper to its maximum height of 15 feet, putting whatever tools he may need on the platform beforehand. He then walks up the steps to the first landing and climbs the ladder to reach the roomy platform where he is then able to work with full security.

Model PUL when telescoped down to its minimum height is only 6'8" high and 32" wide, allowing the machine to be taken through an ordinary doorway and onto freight elevators for transport to any part of the plant. Model PUL is equipped with basewheels and is fully portable.

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| No. 3 Platform lift, 15 ft. 0 in. | 315.00 |

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Other Hi-Reach Telescopers available with platform lifts up to 60 feet.

*Write for full details of Model PUL and larger Telescopers.*

**ECONOMY ENGINEERING COMPANY**

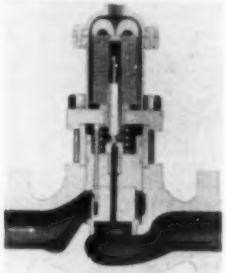
4527 W. Lake Street • Chicago 24, Illinois


*(Continued from page 69)*

## 45—SOLENOID VALVES

**Electro-hydraulic type, engineered for long service**

This valve has a forged steel body with disc and seat of exalloy. It is recommended for oil or oil vapor service on temperatures up to 1000 F and for steam, water, air, gas and general service on temperatures up to 850 F. The valve is packless, has only three moving parts, and operates from a 6 v storage battery.



To open the valve a button is pressed and the solenoid lifts armature to open pilot valve which is held open by permanent magnets. To close valve, the lower solenoid is energized and pulls the armature down to close the pilot valve. Said to be a special feature is the rod-like member in the piston which acts as a timing valve and which can be adjusted to variable closing of the valve proper so as to eliminate water hammer.

Valves come in forged steel in sizes from ½ to 2 in., screwed or flanged. Corrosion resistant solenoid valves in ¼ to 3 in. sizes are available in a variety of materials. Also available are high pressure corrosion resistant valves in 1 to 10 in. sizes. A. F. Hoppe Engineering, Inc.

## 46—THREAD SEALER

**Comes in handy stick form, for pocket or tool kit**

The application of this sealing compound to pipe threads before joints are made up provides a positive seal against gases, brine, acids, water, steam and ammonia at high and low pressures and temperatures, according to manufacturer. Called Thread-Tite, it may be applied to steel, aluminum, iron, brass, plastic, copper, and threads in other materials.

Thread-Tite is also credited with affording protection against seizing or galling. It is said that pipe joints, bolts and studs can be drawn tighter than usual, due to lubricating qualities in the compound, and then easily unscrewed, even after long service. According to company, Thread-Tite won't harden or dry out, is unaffected by vibration. Armite Laboratories.

## 47—TACHOMETER GENERATOR

**Heavy-duty d-c type for accurate speed measurement**

Intended for use with steel and aluminum mill machinery, mine hoists, crushing equipment, wire forming machines and paper mill drives, this new generator is totally enclosed. It features rubber-mounted ball bearings and an alnico permanent-magnet field. The end play has been pre-loaded to 100 lb to counteract the end thrust of large machines.

Output voltage is directly proportional to speed. Sufficient power is produced for control purposes and operation of an instrument simultaneously, or operation of several instruments in parallel. Unit operates clockwise or counterclockwise.

Having a cast steel base, generator may be mounted horizontally or vertically. It has a ⅝ by 1⅞ in. shaft with keyway on pulley end and a ⅛ in. extension on commutator end for hand tachometer readings. Base has slots for belt adjustment. Connection to driving shaft can be direct or by gears, chain or belt.

Speed ranges for the three models are 100-1450, 100-2500, and 100-5000 rpm. Accuracy is ± 0.3 per cent of full scale with the portable instrument and ± 1 per cent with other indicating instruments.

Machines have cast iron waterproof conduit box with gaskets in conduit box assembly and under brush-holder covers. The electric connection to the instrument, which may be remotely located, can be made by conduit or open wiring. Smallest size lead recommended is double connector No. 16 AWG. Special Products Div., General Electric Co.

## 48—MOTOR CONTROLLER

**With enclosed circuit breaker is magnetic in operation**

This manual motor controller and general purpose circuit breaker unit is available in two or three pole construction. Breaker is housed in NEMA Type 1A dust-resisting steel enclosure. Features include hinged cover for easy removal for wiring, eight conveniently located knockouts, ample padlocking facilities, compact size, gray hammertone finish.

Unit can be used as a manual disconnect, but is designed to provide automatic overload and short circuit protection. Maximum ratings; 50 amp, 250 v, a-c; 7.5 hp 250 v single phase 60 cycles; 10 hp, 250 v, three phase, 60 cycles; 500 amp interrupting capacity. Heinemann Electric Co.

## 49—ELECTRICAL TAPE

**For use where high heat conditions are normal**

Said to withstand temperatures up to 300 F, "Scotch" brand electrical tape No. 27 is used without further insulating materials. It has a cloth backing that is fireproof, manufacturer states, and a thermosetting adhesive that sets at 250 F in 2 hr and 300 F in 1 hr, and it contains no sulfur. According to company, this glass cloth backing is unaffected by moisture, will not shrink, stretch or rot and has a tensile strength of 150 lb per inch of width. Minnesota Mining and Mfg. Co.

# *New Books for Plant Engineers*

**An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.**

## All the Answers in One Package*

**TOOL ENGINEERS HANDBOOK edited by Frank W. Wilson in collaboration with the American Society of Tool Engineers Handbook Committee. Size 6 by 9 in.; 1989 pp plus 15 pp of Reference Tables and a 64 pp index; flexible fabricoid binding; 1949. Published by McGraw-Hill Book Co., Inc. Price $15.00.**

OCCASIONALLY a reviewer is faced with a volume that defies adequate description so that he must fall back on the hackneyed adjective, monumental. This is a reference book covering all phases of planning, control, design, tooling, and operations in the mechanical manufacturing industries. Considering the source, it might be expected that the sections on tooling and machines for the cutting, forming, and joining of all materials would be exceptionally well done. This is true, but the 116 sections go much farther, covering all phases of the manufacturing industry so that it might just as aptly have been called the Plant Engineer's Handbook.

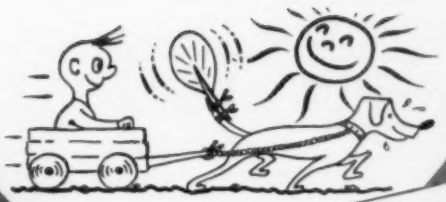
The material was prepared by 152 recognized authors, after many years planning by a special committee of the A.S.T.E. It is definitely a handbook or reference book and not a text book—a practical tool for the industrial plant engineer. Each section is however, followed by a selected bibliography of current reference books covering certain phases in detail. Definitely a "must" for every industrial plant engineering library.

## How the Engineer Uses Psychology*

**APPLIED EXPERIMENTAL PSYCHOLOGY by Alphonse Chapanis, Wendell R. Garner and Clifford T. Morgan. Size 6 by 9 in.; 421 pp plus index; cloth bound. Published by John Wiley & Sons, Inc. Price $4.50.**

A PRACTICAL TEXT dealing with what we know of the capacities, abilities, and physical limitations of human beings in relation to the design and operation of machines and, the efficiency of man-machine systems. It is an outgrowth of a series of lectures on engineering psychology for post-graduate engineering students at Annapolis.

The sub-title of the book, Human Factors in Engineering Design, is descriptive of the contents. It is divided into 14 chapters, on such factors as how we see, hear and speak, how we make movements and react to controls. These capacities are related to practical design problems as instrument dials and legibility, visual displays, signalling systems, arrangement of work, the working environment, and the problems

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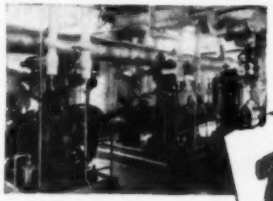

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of fatigue and performance. Forty pages are devoted to a brief review of the nature and use of statistics, an important tool in research and finding increased use in applied engineering. Each chapter has a selected bibliography for reference purposes.

The book is clear and understandable, free from the technical jargon which makes the average work on psychology trying for the engineer to follow. It should be valuable to all engineers dealing with the design, arrangement and use of machinery by human beings or concerned with the areas in which they must work.

## Auditorium Layout and Arrangement*

**THEATRES AND AUDITORIUMS by Harold Burris-Meyer and Edward C. Cole. Size 8½ by 11½ in.; 221 pp plus index; 1949; cloth bound. Published by Reinhold Publishing Corp. Price $8.00.**

THIS IS an unusual book not only from the standpoint of format and arrangement but from content as well. It deals entirely with the architectural and utilization factors involved in the design of theatres and public auditoriums. It goes into detail on audience traffic, acoustics, power heat, air condition, and plumbing, light, intercommunication systems, and stage machinery.

While it deals with a specific type of building construction, the engineering factors detailed can be utilized to advantage by anyone concerned in any way with the layout, design or operation of large auditoriums, checking facilities, rest rooms, or, in fact with any large industrial area. Harold Burris-Meyer is an associate professor at Stevens Institute of Technology and Edward C. Cole is associate professor at Yale University and a consultant in theatre planning and management.

## Electrical Modernization for Textile Plants

**HOW TEXTILE MILLS ARE MODERNIZING. Size 8½ by 11 in.; 94 p; plastic bound paper cover. Published by General Electric Co., Schenectady, N. Y. Price $1.25.**

THIS ILLUSTRATED manual is one of the first extensive reports to industry on general trends in the textile field modernization program. Among the major trends uncovered by the book are comprehensive mill conditioning; modern materials handling; applying power at the point of use; higher average speeds; finer quality control; continuous processing; new electric tools; and new processing methods.

## Electronics for the Layman and Professional*

**INDUSTRIAL ELECTRONICS by Andrew W. Kramer. Size 6 by 9 in; 306 pp plus index; cloth bound; 1949. Published by Pitman Publishing Corp. Price $6.00.**

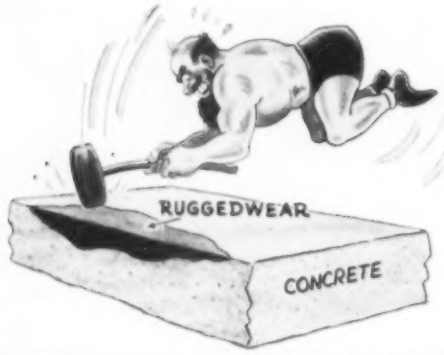
WRITTEN IN CLEAR and simple language, by a recognized authority in the field of industrial electronics and atomics, this book explains the fundamental principles of electronics, and shows how electronic equipment is used and can be used to an increasing extent in industry. It is a practical text for beginners, for those interested in this field as a hobby, for those already using electronic industrial equipment, as well as, for those interested in developing further applications in a field as yet only partially developed.

The book is divided into 22 chapters; the first 14 dealing with fundamental equipment, principles and purposes. The remaining chapters deal with practical applications in control and regulation, instrumentation, rectification, heating, microscopes and other industrial applications.

## All the Answers on Industrial Insurance

**BUYING AND ADMINISTERING CORPORATE INSURANCE by Russell B. Gallagher. Size 6 by 9 in.; 123 pp; paper bound. Published as Research Report Number 15 by the American Management Association, 330 West 42nd Street, New York 18, N. Y. Price $3.75.**

THIS IS said to be the first analysis of corporate insurance management practices and is based on a questionnaire survey of 226 representative companies, case studies and interviews with leading men in the industry. It covers management policies, operation and organization of insurance department, an analysis of planning and risks, what and how to insure, the selection of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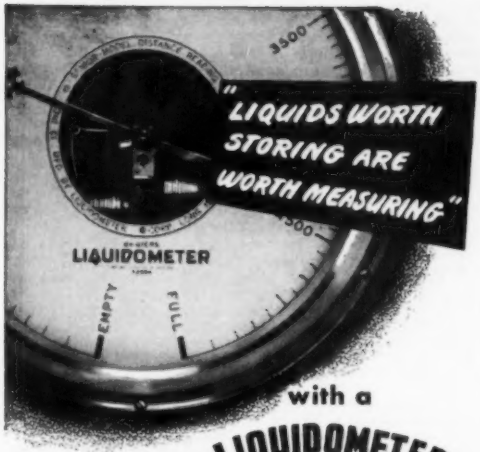


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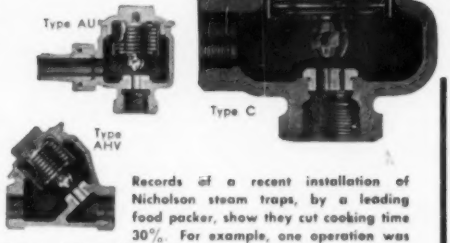
Nicholson Steam Traps

# CUT Processing Time 30%

for Food Packer

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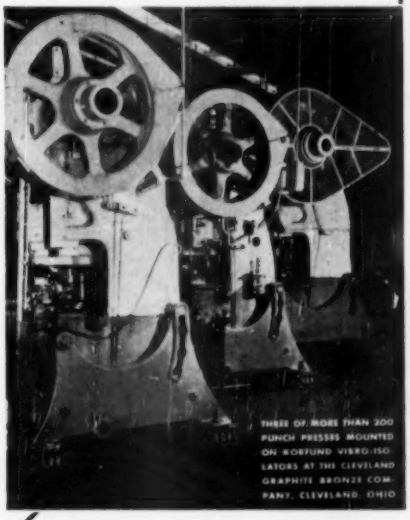

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companies and placing and maintaining insurance coverage, analysis of losses, how to integrate operations, and, the questionnaire and tabulation of answers on which the study was based. The second appendix covers business forms used by various companies for different types of coverage.

## Plating Solution Impurities

**DETERMINATION OF IMPURITIES IN ELECTROPLATING SOLUTIONS. Size 5½ by 8½ in.; 84 pp; paper bound. Published as A. E. A. Research Report Serial No. 6 by the American Electroplaters' Society, P. O. Box 168, Jenkintown, Pa. Price $1.25.**

A MANUAL dealing with the laboratory determination of impurities in nickel electroplating solutions and covering silica, sodium, potassium, cadmium, aluminum, ammonium, chromium, zinc and calcium.

## Concrete Facts and Practice*

**PLAIN CONCRETE by Edward E. Bauer. Size 6 by 9 in.; 422 pp. plus 3 appendices and index; cloth bound; third edition, 1949. Published by the McGraw-Hill Book Co. Price $5.00.**

THIS is a text book used by the author who is Associate Professor of Civil Engineering at the University of Illinois. The second edition appeared in 1936. The new edition includes significant developments which have occurred during the intervening period—such things as: air entrained concrete, the use of which is rapidly increasing; high alkaline cements which react unfavorably with certain siliceous aggregates; and, important changes in specifications and testing techniques. The book is divided into 14 chapters covering all phases of standard and special cements, aggregates, mixtures and proportioning, pouring, curing and field control. There are also chapters discussing: factors affecting the strength of concrete; durability; workability; waterproofing; specifications; sampling; and testing.

## Long Distance Electrical Safety

**INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY AND COMMUNICATION LINES. Size 5 by 8 in.; 372 pp plus index; cloth bound; 1949. Published as National Bureau of Standards Handbook H43 and for sale by the Superintendent of Documents Government Printing Office, Washington 25, D. C. Price $1.50.**

THIS NEW HANDBOOK contains definitions, grounding rules, and part 2 of the fifth edition of the National Electrical Safety Code, dealing with the construction and maintenance of overhead and underground lines. Originally published as Handbook H32, and Part 2 of the code is originally published as Handbook H39. Data in the appendices cover information useful in making computations dealing with the strength of supporting structures, and determining crossing clearances. In some cases there are suggested engineering short cuts for approximations of code formulae. The National Electrical Safety Code covering grounding rules and Parts I to V inclusive was published in 1948 as National Bureau of Standards Handbook H30. It is for sale by the Supt. of Documents, price $1.25.

## Steel Plate Standards

**ALLOY STEEL PLATES. Size 6 by 9 in.; 66 pp; paper bound. Published as Section No. 7 of the Steel Products Manual by the American Iron and Steel Institute, 350 Fifth Avenue, New York 1, N. Y. Price $0.25.**

ONE OF A SERIES of 29 bulletins covering steel products. This section on alloy steel plates was originally issued in 1947 and revised in October 1949. It covers metallurgical, quality, and chemical requirements, manufacturing process, standard practice tables, packaging, marking and loading methods.

## A Detailing Handbook*

**ENGINEERING FOR PRODUCTION by Walter Ernst. Size 8½ by 11 in.; 224 pp plus index; spiral binding with cloth cover; copyright, 1949. Published by the Research Press, Inc. Price $10.00.**

A COMPREHENSIVE handbook on engineering drawings, how they may be produced economically, be understood and conform to established standards. The book is divided into 27 sections the first 12 dealing with drawings, drawing room procedures, checking, standardization, sizes, materials, and preparation of the bill of materials. The balance of the sections deal with detailing and standards for a specific

*(Continued on page 80)*

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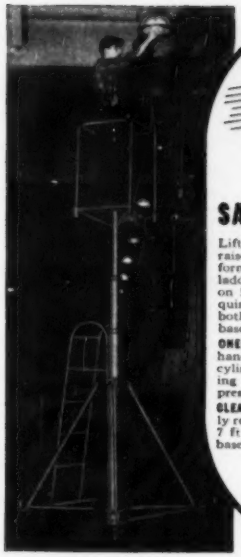

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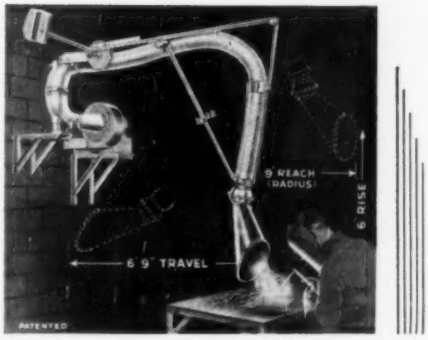


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### SUPER SHINE-ALL
**Cleans Up on FLOOR Accidents**

Hillyard's wonder cleaner goes to work instantly — cleans dirt and grease from floors easily. Works on all types of floors . . . not a soap, but a neutral liquid chemical cleaner that leaves no slippery film . . . requires no rinsing. Just mop it on, squeegee or damp mop it off. Approved by Underwriters' Laboratories.

**NON-INFLAMMABLE**
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### HILCO-LUSTRE
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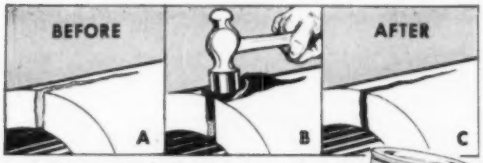
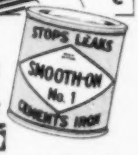



A—Deep crack. B—Tamping Smooth-On in. C—Crack completely sealed.

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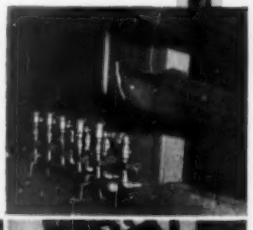
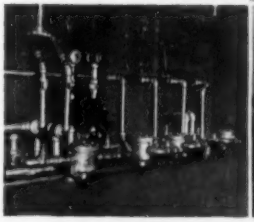
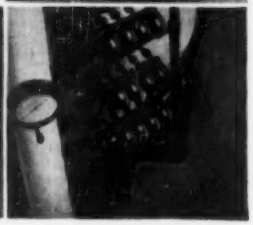
Use individual trapping—a separate trap on each unit and make sure that condensate is not held back to slow up your operation.

**THE SELECTION** of the right steam trap is not difficult. Sarco Selection Chart No. 1600 shows first and second preference for standard applications, or the Sarco man will study and recommend for every process in your plant.







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(Continued from page 76)

type of equipment, such as castings and forgings, metals, threaded and screwed connections, piping, packings, keys, gears, ball bearings, etc. Each section is completely self-contained, and may be used without reference to any other section.

## The How and Why of Pumps*

**PUMP QUESTIONS AND ANSWERS** by **Roy Carter, Igor J. Karassik, and Elliott F. Wright.** Size 6 by 9 in.; 337 pp plus index; cloth bound; first edition, 1949. Published by the McGraw Hill Book Company. Price $5.00.

A PRACTICAL "How and Why" book covering the construction, application, operation, installation, maintenance, and trouble-shooting of centrifugal, reciprocating, regenerative, rotary and vertical turbine pumps. It is arranged in questions and answers form in 20 chapters and is well illustrated with drawings, photographs, and charts.

## Incentive Methods Help Cut Costs*

**JOB EVALUATION AND WAGE INCENTIVES** edited by **Carl C. Harrington.** Size 6 by 9 in.; 300 pp including 105 sample charts and forms; cloth bound; 1949. Published by Conover-Mast Publications, Inc. Price $4.00.

JOB EVALUATION and Wage Incentive is now such an established part of the industrial picture that few in supervisory positions can avoid contact with it. The book consists of 32 chapters written by 27 authors. It is divided fundamentally into two parts, the first dealing with job evaluation, and the second with wage incentive plans. It deals in general with case studies and actual results of tested methods in a large number of representative industries. It is in effect a working manual.

## For Earth Movers

**PROPER SIZING OF EXCAVATORS AND HAULING EQUIPMENT.** Size 8½ by 11 in.; 24 pp; paper bound. Published as Technical Bulletin No. 3 by the Power Crane and Shovel Association, 74 Trinity Place, New York City. Price $0.50.

A PRACTICAL discussion on the proper selection and sizing of excavating equipment for use in conjunction with hauling equipment for economical operation. Tabulated data show shovel capacity as a function of the soil, maximum reach, angle of swing, optimum depth of cut and sizes of standard equipment. It also discusses such factors as haul distance, fleet operation and proper synchronizing and scheduling of the hauling equipment in relation to the excavating equipment.

## Designs for Welding*

**WELD DESIGN** by **Harry D. Churchill and John B. Austin.** Size 6 by 8½ in.; 216 pp including index and appendices; cloth bound; 1949. Published by Prentice-Hall, Inc. Price $6.65.

THIS BOOK is intended to supply a definite need for a concise volume on welded machine-base design. The eleven chapters deal with construction materials of machine bases; stress-analysis and design data; designing arc-welded machine bases; application of welded-design principles; welding specifications; weldery procedure; welding processes; flame cutting and flame hardening; forming of metals; and estimating welded machine base costs. This book is small and compact but practical and should prove valuable to any person concerned with welded problems and procedure.

## Heat Exchanger Standards

**STANDARDS OF TUBULAR HEAT EXCHANGERS.** Size 8½ by 11 in.; 93 pp; spiral binding, paper cover; second edition, 1949. Published by the Tubular Exchanger Manufacturers Association, Inc., 53 Park Place, New York 7, N. Y. Price $3.00.

INDUSTRY STANDARDS as compiled by the technical committee of the association and covering a wider scope than the 1941 edition. It is divided into 8 sections, covering fabrication and performance nomenclature, tolerances, standards and material specifications.

Section 7 covering 37 pages, is primarily reference data in chart form, covering heat transfer coefficients, graphic solutions, specific heats and specific gravities of various gases and liquids, thermal conductivities and temperature-viscosity relationships. Section 8, four pages, deals with installation, operation, and maintenance of shell and tube heat exchangers.


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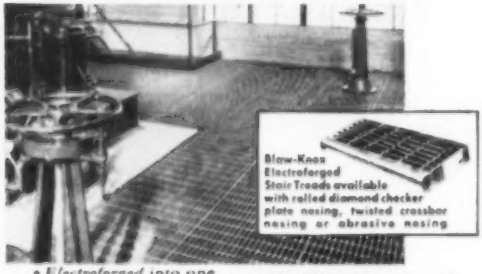
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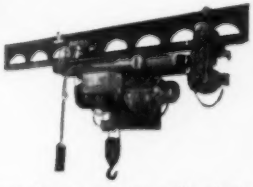

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